# REPORT DOCUMENTATION PAGE

*Form Approved OPM No. 0704-0188*



| **1. REPORT DATE:** Oct 2003 | **2. REPORT TYPE:** Final | **3. DATES COVERED:** N/A |
|---|---|---|
| **4. TITLE:** Is Enlisted Retention Too High? | | **5a. CONTRACT NUMBER:** N00014-00-0700 |
| **6. AUTHOR(S):** Hansen ML, Wenger JW | | **5c. PROGRAM ELEMENT NUMBER:** 65154N<br>**5d. PROJECT NUMBER:** R0148 |
| **7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES):**<br>Center for Naval Analyses<br>4825 Mark Center Drive<br>Alexandria, Virginia 22311-1850 | | **8. PERFORMING ORGANIZATION REPORT NO.:**<br>CRM D0008594.A2 |
| **9. SPONSORING AGENCY NAME(S) AND ADDRESS(ES):**<br>Military Personnel Plans and Policy Division (N13))<br>2 Navy Annex<br>Washington, DC 20380-1775 | | **10. SPONSOR ACRONYM(S):** N/A<br>**11. SPONSOR REPORT NO.:** N/A |
| **12. DISTRIBUTION AVAILABILITY STATEMENT:** Distribution unlimited. | | **13. SUPPLEMENTARY NOTES:** N/A |



**14. ABSTRACT:** (U) Large military pay raises and a healthy economy have generated record reenlistment levels for the Navy. The consensus appears to be that higher retention is better for the Navy; more experienced Sailors improve readiness and allow the Navy to devote fewer resources to the recruiting, training, and acculturation of new accessions. Given recent increases in reenlistment rates and bonuses, however, further increases may not be cost-effective. This study examines the costs and benefits of retention, and thus develops rating-specific reenlistment goals for the Navy.

(U) We estimate that most enlisted personnel are in ratings for which the costs of reenlistment exceed the benefits. In other words, we conclude that the cost-effective level of reenlistment is lower than current goals. The Navy should not, however, make drastic cuts to reenlistment bonuses. Advocating lower-than-recent increases in basic pay, without decimating the SRB budget, is a more cost-effective and flexible approach to lowering reenlistment.

(U) Our results also indicate that economic conditions affect the cost-effective reenlistment level. A deterioration of the economy generates higher retention without any increase in bonuses. In contrast, improvements in economic conditions act like a "tax" on SRB effectiveness. Therefore, reenlistment goals will often change with economic conditions.

**15. SUBJECT TERMS:** Return on investment, enlisted retention, reenlistment bonuses

| **16. SECURITY CLASSIFICATION:** | **17. LIMITATION OF ABSTRACT:** | **18. NUMBER OF PAGES:** 100 |
|---|---|---|
| **a. REPORT:** Unclassified<br>**b. ABSTRACT:** Unclassified<br>**c. THIS PAGE:** Unclassified | SAR | **19. NAME/PHONE OF RESPONSIBLE PERSON:**<br>Henry S. Griffis (703) 824-2208 |

Standard Form 298 (Rev. 8-98)Prescribed by ANSI Std. Z39.18

CRM D0008594.A2/Final
October 2003

# Is Enlisted Retention Too High?

Michael L. Hansen • Jennie W. Wenger
with
Albert B. Monroe IV and Henry S. Griffis




4825 Mark Center Drive • Alexandria, Virginia 22311-1850

Approved for distribution: Octobe

Henry S. Griffis

Henry S. Griffis, Director
Workforce, Education and Training Team
Resource Analysis Division

This document represents the best opinion of CNA at the time of issue.
It does not necessarily represent the opinion of the Department of the Navy.



Distribution limited to DoD agencies. Specific authority: N00014-00-D-0700.
For copies of this document call: CNA Document Control and Distribution Section at 703-824-2123.

# Contents

# Executive summary

## Background

Relatively large military pay raises and a sagging domestic economy have combined to generate record enlisted retention levels for the Navy. Reenlistment rates are at or above the goals set by the CNO, and leadership has discussed the possibility of setting even higher retention goals. The consensus appears to be that higher retention is better for the Navy; more experienced Sailors improve readiness and allow the Navy to devote fewer resources to the recruiting, training, and acculturation of new accessions.

Despite this conviction, recent analyses have demonstrated that higher reenlistment is only cost-effective for a small group of highly technical ratings. Reenlistment rates and bonuses, however, have increased in these ratings over the last few years, raising the costs of further increases in reenlistment. If it is no longer cost-effective to increase reenlistment in these ratings, the implication is that Navy reenlistment rates may be too high.

Given these concerns, the Director, Military Personnel Plans and Policy Division (N13), asked CNA to examine the costs and benefits of retention as a way to develop rating-specific reenlistment goals for zone A enlisted personnel. Furthermore, to establish a link between changing economic conditions and the cost-effective level of reenlistment, we explore how changes in civilian employment opportunities affect both enlistment and reenlistment behavior.

## Methodology

For each rating, we identify and quantify the primary costs and benefits to the Navy of higher reenlistment. If the benefits of higher reenlistment are greater than the costs, the cost-effective level of reenlistment is higher than its current level. To estimate the reenlistment goal, we recalculate benefits and costs, assuming an increase in

a rating's selective reenlistment bonus (SRB). We continue this process until benefits no longer exceed costs; the point at which benefits equal costs is the reenlistment goal for this rating. Alternatively, if costs exceed the benefits for a rating, SRBs are lowered in a similar fashion until costs equal benefits.

We make two important assumptions in our cost-benefit analysis. First, it is a steady-state analysis; consequently, the SRB levels implied by our results are not necessarily the optimal levels in the short run. Reenlistment bonuses are an effective tool to minimize manning shortages and should differ from long-run levels as manning problems dictate. Second, we assume a constant level of basic pay when calculating the benefits and costs of reenlistment. Though the Navy does not have the ability to change basic pay on its own, it can advocate raising or lowering basic pay as conditions require.

## Findings

For a small number of ratings, our reenlistment goal estimate is *higher* than current rates; our analysis suggests that it would be cost-effective to raise SRBs in these ratings. For a larger group of ratings, however, the cost-effective level of reenlistment is lower than current rates; reductions in SRBs for these ratings would generate savings to the Navy. For most of the ratings that do not receive SRBs, it is not cost-effective to offer bonuses. Absent any decreases in across-the-board pay, reenlistment goals for these ratings are equal to current rates. Because most enlisted personnel are in ratings for which reenlistment should decline, our results suggest that the cost-effective level of reenlistment is lower than the Navy's current steady-state goals.

These conclusions seem to stand in contrast to previous recommendations for an increase in reenlistment for high-tech ratings. However, the costs of higher seniority have risen dramatically as a result of recent increases in compensation in the E-5 to E-7 paygrades. Higher seniority costs reduce the return on investment of higher retention and lead to lower reenlistment goals. Furthermore, our estimates of reenlistment goals for high-tech ratings are higher than historical levels of reenlistment in these ratings. In other words, bonuses and reenlistment rates have increased in these ratings, but only some of this increase was cost-effective. Further increases in reenlistment

would be prohibitively expensive; in fact, our analysis suggests that *lowering* reenlistment in these ratings would be cost-effective.

Finally, our results indicate that economic conditions do affect the cost-effective level of reenlistment. A deterioration of the civilian economy generates higher retention without any increase in reenlistment bonuses. The Navy still has to pay higher seniority costs, but the value of the additional experience, combined with recruiting and training cost savings, overwhelms the cost of this higher reenlistment rate. In contrast, improvements in economic conditions act like a "tax" on SRB effectiveness. For some ratings, it is cost-effective to raise SRBs to offset the impact of economic conditions. For other ratings, however, it would be prohibitively expensive to return reenlistment to previous levels.

## Implications and recommendations

Our analysis points to lower reenlistment levels in all but a few ratings. The Navy should *not*, however, immediately cut the SRB budget to the levels implied by our results. Rather, it is more efficient to pursue across-the-board reductions in retention with smaller increases in basic pay. Furthermore, bonuses play an important role, allowing the Navy to target compensation to ratings with manning problems. Advocating lower-than-recent increases in basic pay, without decimating the SRB budget, is the most cost-effective approach to lowering reenlistment and preserves the greatest flexibility for the Navy.

If it is not feasible to pursue smaller increases in basic pay, we recommend adopting a *marginal* reduction in reenlistment. A modest cut in SRBs would move the Navy closer to a cost-effective level of reenlistment. If manning levels and economic conditions continue to support a decline in reenlistment after this reduction, the Navy should marginally decrease bonuses in these ratings again. Taking an iterative approach would allow the Navy to monitor reenlistment levels and ensure that declines are not larger than what is desired.

# Introduction[1]

Relatively large military pay raises and a sagging domestic economy have combined to generate record enlisted retention levels for the Navy. Recent reenlistment rates are at or above the goals set by the Chief of Naval Operations (CNO). Navy leadership has discussed the possibility of setting even higher retention goals—goals that even recently were thought to be unattainable.

The consensus appears to be that higher retention is better for the Navy. One reason is that higher reenlistment and lower attrition allow the Navy to bring in fewer accessions each year and to devote fewer resources to the recruiting, training, and acculturation of new recruits. Second, Navy leadership recalls the difficult recruiting and retention environment of only a few years ago. To protect itself against inevitable improvements in civilian labor markets, the Navy wishes to take advantage of a favorable environment and increase retention while it can. A third reason is a conviction that more experienced Sailors are more productive, and that higher retention leads to higher readiness.

Despite these beliefs, there are a few caveats to the unequivocal benefits of higher retention. Recent analyses have demonstrated that higher reenlistment is not necessarily cost-effective. In general, only those ratings with relatively high training costs and/or high readiness benefits of experience would realize a positive return on investment of higher retention. Recently, however, these ratings have followed the Navy-wide trend of higher reenlistment. Because reenlistment bonuses are necessary to increase retention further, additional increases in reenlistment would require paying higher bonuses to

1. We are grateful to Dave Gregory, David Reese, and Ian MacLeod for their efforts in preparing the data for our analysis. In addition, we wish to thank Katrine Wills for her assistance in modeling the relationship between reenlistment and continuation behavior.

people who would have reenlisted anyway. This decreases the cost-effectiveness of higher reenlistment in these ratings.

For all other ratings, previous research has demonstrated that *lower* reenlistment would be cost-effective. Of course, this does not mean that these ratings should have zero reenlistment. At some level of reenlistment, the costs of reenlistment would no longer exceed its benefits. In other words, the cost-effective level of reenlistment in these ratings is lower than current levels.

If this intuition is correct, setting different reenlistment goals for different specialties would be the most cost-effective strategy for the Navy. For each rating, the optimal reenlistment rate is that at which the costs and benefits are identical; there is no value in either increasing or decreasing reenlistment. Furthermore, it is possible that these goals change with economic conditions, because civilian labor markets influence both the costs and the benefits of higher reenlistment. If the economy affects these costs and benefits in different ways, cost-effective reenlistment goals depend on the economic environment.

For these reasons, the Director, Military Personnel Plans and Policy Division (N13) asked CNA to examine the costs and benefits of reenlistment, as a way to develop rating-specific reenlistment goals for the Navy. In this research memorandum, we summarize the results of this analysis. Furthermore, to establish a link between changing economic conditions and the cost-effective level of reenlistment, we examine how changes in civilian employment opportunities affect both enlistment and reenlistment behavior.

We begin with a brief discussion of our methodology and the sources from which we obtained our data. Then we summarize the tradeoffs the Navy can make between accessions and reenlistments. The next two sections examine, in detail, each component of the benefits and costs of higher retention. In the last three sections, we present rating-specific reenlistment goals, discuss the extent to which these goals vary with changing economic conditions, and present conclusions.

# Methodology and data

## Approach

Our methodology draws heavily from previous research. In general, we follow the strategy of [1], which identifies and quantifies the major benefits and costs of reenlistment. In particular, we follow [1] and limit our analysis to zone A reenlistment rates. We use the steady-state model of continuation behavior developed by [2] for the bulk of our analysis.[2] This framework allows us to model the impact of reenlistment on continuation rates, to estimate tradeoffs between accessions and reenlistments, and to quantify many of the benefits and costs of reenlistment. Finally, we use estimates of the relationship between compensation and reenlistment from [3] to estimate the costs of reenlistment and to provide recommendations for targeting compensation to reach reenlistment goals.

Our analysis examines whether or not higher reenlistment is cost-effective on a rating-by-rating basis. We do *not* consider how changes in reenlistment might alter the Navy's ability to meet manpower goals. This should not imply that requirements are unimportant; on the contrary, the ability to man billets should be the primary factor in determining how many people to retain. Rather, our analysis offers guidance on the most cost-effective mix of personnel with which to man billets.

2. This model assumes FY01 continuation behavior in the steady state, with a few modifications. These continuation rates are adjusted to incorporate FY02 first-term attrition, expansion of the "Top 6" paygrades, and FY97 unemployment levels. This model predicts a zone A reenlistment rate of 58 percent and implies a non-prior-service accession requirement of about 42,300.

## Limitations

A few important limitations of our analysis should be considered when interpreting our results. First, this is a *steady-state* analysis. In a steady state, conditions that affect individual behavior are constant over time. Consequently, economic conditions, personnel policies, and the Navy work environment are presumed to be unchanging. Similarly, retention behavior is assumed to be identical for each cohort that enters the Navy.

Of course, the Navy will never find itself in a steady state; conditions that affect individual behavior are always changing, and each cohort responds to these changing conditions. Therefore, long-term reenlistment goals are not necessarily identical to short-term requirements. Suppose, for example, that a rating currently has manning shortages; alternatively, suppose that a decrease in reenlistment in a rating would create such a shortage. It is possible for the long-term reenlistment goal for this rating to be lower than the current level of reenlistment; however, this does not imply that current reenlistment levels are too high.

The cost of short-term manning shortages is very real, for it decreases readiness of the enlisted force. If such a cost is sufficiently large, a cut in reenlistment in these ratings would *not* be cost-effective. If manning shortages and their costs are large enough, it is even possible that *increases* in reenlistment (and reenlistment bonuses) in these ratings are desirable. Of course, the opposite can also occur; ratings that are currently overmanned could benefit from short-term decreases in reenlistment rates, even if the long-term reenlistment goal is higher than current rates.

Second, the reenlistment goals we estimate are those that would be cost-effective to the Navy if it were not constrained by requirements. Our focus should not imply that requirements are unimportant. On the contrary, the Navy's ability to fully man its billets should be the primary factor in determining the number of personnel to be retained. However, if requirements can be filled with different combinations of junior and senior personnel, our analysis serves as a guide to the most cost-effective mix of personnel. Our rating-specific goals should be interpreted in this fashion. In other words, if the cost-effective level of

reenlistment would fully man billets in a particular rating, this should be the Navy's goal for the rating. On the other hand, if higher reenlistment than the cost-effective level is necessary to fill the billets, the Navy's reenlistment goal should be set so that all billets are filled.

Finally, our estimates rely heavily on *marginal effects* of changes in a Sailor's environment. In general, marginal effects are accurate for marginal changes in the variables being considered. With larger changes, there is no guarantee that the actual change will be close to the predicted change. For some of the ratings that we examine, we conclude that the cost-effective reenlistment goal is significantly different from current rates. The large change in reenlistment bonuses necessary to achieve this goal might have an impact on retention that is different from what the marginal effect predicts. Dramatic changes within a rating could well affect morale; this could change the entire recruiting/reenlistment environment.

This reliance on marginal effects is an unavoidable limitation of our analysis. Note, however, that this limitation does *not* change the qualitative conclusions of our analysis. Ratings for which the costs of reenlistment exceed the benefits would still have a lower reenlistment rate goal than their current levels. Similarly, ratings for which we estimate a positive return on investment of reenlistment would still have higher goals.

## Data

It takes a combination of data from several different sources to estimate reenlistment goals for Navy enlisted ratings. Throughout this research memorandum, we provide more specific details about the data in the sections in which they are used. Here we briefly describe the major sources of data and their role in our analysis.

Our recruiting data come from Commander, Navy Recruiting Command (CNRC). We use FY02 data on recruiting expenditures to separate the fixed and variable costs of recruiting and to estimate the costs of recruiter time. Data on the level of enlistment bonuses (EBs) and the Navy College Fund (NCF) come from the Navy's PRIDE (Personalized Recruiting for Immediate and Delayed Enlistment) data. Finally, we have data from FY92 to FY01 at the Navy Recruiting District

(NRD) level that we use to estimate the relationship between changes in economic conditions and the propensity to enlist.

Data on training costs come primarily from CNA's Street-to-Fleet database. Training often takes place over several years before a Sailor reaches the fleet, so we use course-level data for each Sailor who entered the Navy in FY97-99. We use these data to estimate the length of a rating's training pipeline and to estimate the number of instructors needed to train Sailors.

Our estimates of the value of experience come from the Current Population Surveys (CPS). To maintain comparability with the majority of Navy enlisted personnel, our civilian data include those who work full-time throughout the year and are neither high school dropouts nor holders of postgraduate degrees. We focus on data from FY91-01 to obtain more precise estimates of civilian returns to experience.

Data on reenlistment decisions, reenlistment bonus levels, and the characteristics of the Sailors who make these decisions come from CNA's holdings of the Enlisted Master Record (EMR) data. Because FY01 reenlistment rates are close to the Chief of Naval Personnel's (N1's) steady-state goals [4], we focus on FY01 data for the majority of our analysis.

Finally, our data on basic pay and allowances for housing and subsistence come from the Office of the Secretary of Defense.[3] These data vary by paygrade, length of service, and whether someone has dependents; this allows us to place a dollar value on each of the benefits and costs of reenlistment. Unless otherwise noted, all amounts presented in this research memorandum are in 2003 dollars.

3. These data can be readily accessed at *http://www.defenselink.mil/cgi-bin/rmc.pl.*

# Tradeoff between accessions and reenlistments

For a given endstrength, accession requirements are a function of *continuation rates*, the proportion of servicemembers remaining in the Navy from one year to the next. The higher the continuation rates, the lower the number of accessions needed to replace servicemembers who leave the Navy. In the short run, keeping endstrength constant requires an additional accession for every Sailor who separates from the Navy. In the long run, however, more than one additional accession is needed to replace a person who chooses to leave.

This accession-retention tradeoff is central to our analysis because it directly affects the costs and benefits of reenlistment. The greater the number of accessions required to replace a foregone reenlistment, the greater the benefits of reenlistment. A reliable estimate of this relationship, then, is necessary for establishing reenlistment goals.

Continuation behavior can be separated into two distinct components: attrition and reenlistment. For this analysis, we define *attrition* as separation from the Navy before the end of one's obligation and *reenlistment* as a choice to make an additional commitment to the Navy.[4] In quantifying the benefits of reenlistment, we are interested in the degree to which accessions can be lowered when reenlistment rates increase. This tradeoff, however, depends on the relationship between reenlistment and continuation rates as well as the relationship between reenlistment and attrition rates. For example, if increases in reenlistment cause a decline in attrition, an additional reenlistment can replace more accessions than it could without the decrease in attrition.

4. This definition of reenlistment incorporates both reenlistments and unconditional (long-term) extensions. Unless otherwise indicated, our use of the term *reenlistment* is meant to refer to both of these concepts.

Reference [2], an analysis of steady-state accession requirements, models the determinants of continuation behavior. The authors conclude that financial incentives (e.g., selective reenlistment bonuses) increase continuation rates by both increases in reenlistment and slight reductions in attrition. Using this model, we estimate that one additional reenlistment can replace about 1.4 accessions.[5] This estimate is the tradeoff that we assume throughout this analysis.

5. Our estimates range from 1.3 to 1.6, depending on the fiscal year on which we focus.

# Benefits of higher reenlistment

In this section, we examine the primary benefits to the Navy of reenlistment. Increases in reenlistment allow the Navy to bring in fewer accessions. This has three major consequences. First, the Navy does not need to devote as many resources to recruiting. Second, fewer recruits means that fewer Sailors require training in Navy specialties. Finally, higher reenlistment implies a more senior force. To the extent that seniority improves readiness, the Navy benefits from this higher experience. We examine each of these three benefits separately and present examples of each for a few ratings; complete results can be found in appendix A.

## Recruiting cost savings

A number of researchers have estimated both average and marginal costs of recruiting [5, 6]. Average total cost is defined as total recruiting costs divided by the number of recruits; this is often disaggregated into (average) variable and fixed costs. Variable costs are those that vary with the number of recruits; fixed costs do not. In contrast, marginal cost is the cost of one additional recruit. Marginal costs generally differ from average costs because it is assumed that attaining an additional recruit requires more resources than were needed to bring in previous accessions.

All of these cost measures are typically computed separately for different types of recruits. A-cell recruits are more expensive than C-cell recruits, who are more expensive than B-cell recruits.[6] This disparity results from the amount of recruiter time necessary to procure

6. A-cell (high-quality) recruits are those who complete high school and score at or above the 50th percentile on the Armed Forces Qualification Test (AFQT). B-cell recruits also score at or above the 50th percentile on the AFQT but do not complete high school. C-cell recruits complete high school but score below the 50th percentile on the AFQT.

different types of recruits and to differences in the financial incentives offered to recruits of varying quality.

Furthermore, recruiting costs vary by rating because of differences in the quality mix of recruits by rating and in the level of financial incentives offered for enlisting into different training pipelines. Although many recruiting costs are not explicitly allocated toward recruiting into different ratings, we are still able to estimate the cost of bringing in additional recruits into specific ratings.

By definition, fixed costs do not affect the cost of bringing in one additional recruit; these costs remain constant, regardless of the level of accessions. An important issue, therefore, is the disaggregation of total costs into fixed and variable costs. In addition, assumptions about how recruiters allocate their time among the different quality types will drive many of the differences in costs by quality cell. We address each of these issues before turning to our estimates of rating-specific recruiting costs.

## Fixed and variable costs

Table 1 lists actual FY02 recruiting expenditures, presented separately by type of expenditure.[7] During FY02, the Navy spent almost $580 million on recruiting about 44,000 accessions. About 35 percent of this went directly to recruiters' salaries—by far, the largest component of recruiting costs. In addition, the Navy paid $100 million in EBs, $78 million for advertising, and about $72 million for military personnel who are not recruiters but contribute to the recruiting process. Other recruiting costs—support costs, civilian salaries, and the NCF expenditures—total about $118 million.

Expenditures on EBs, the NCF, and the loan repayment program are certainly variable costs: as the number of recruits increases, these costs will generally rise as well.[8] In contrast, costs associated with the

7. These data were provided by Commander, Navy Recruiting Command.

8. It is possible that these costs remain constant as accessions increase, if the Navy chooses to bring in recruits that do not qualify for these incentives. These costs have the *potential,* however, to change with the number of accessions; therefore, they are considered variable.

recruiting "infrastructure"—salaries of other military personnel, civilian personnel, and support costs—are likely fixed costs. As long as we are considering small (i.e., marginal) changes in the number of accessions, it is not likely that the Navy would expand the recruiting infrastructure. A similar argument can be made for advertising expenditures: although large increases in accessions would probably require an increase in advertising, these budgets will remain constant for marginal changes in the number of recruits.

Table 1. FY02 recruiting costs ($M)

| Budget item | Expenditure |
|---|---|
| Recruiters | 210.1 |
| Enlistment bonuses | 100.0 |
| Advertising | 78.1 |
| Other military personnel | 71.5 |
| Support costs | 68.1 |
| Civilian personnel | 26.0 |
| Navy College Fund | 23.7 |
| Loan repayment program | 0.1 |
| **Total** | 577.6 |

Finally, we consider the salary of recruiters to be a variable cost. Even though marginal changes in accessions will not lead to differences in the number of recruiters, a higher recruiting goal will require a greater investment of the recruiter's time to access a Sailor. Because salaries compensate people for the time they spend working, we include recruiter pay in our calculation of marginal costs.

## Recruiters' time and recruit quality

The consensus in the literature is that successful recruiting requires different levels of effort for different types of people. Unfortunately, no existing studies directly measure the amount of time recruiters spend to successfully enlist A-cell, B-cell, or C-cell recruits. The best estimate of this differential comes from [7], which uses the Navy's stated planning factors to calculate the amount of time necessary to procure each type of recruit. The author concludes that a recruiter

can recruit five B-cells or two C-cells in the same amount of time it takes to recruit one A-cell.[9]

## Average variable costs of recruiting

Table 2 lists average variable recruiting costs in FY02, presented separately by type of expenditure and type of recruit.[10] These costs vary significantly by recruit quality, from about $3,900 for a B-cell recruit to over $19,600 for someone entering the nuclear field. Recruiters' salaries are disaggregated by recruit quality following [7]: average costs of A-cells and those entering the nuclear field are five (two) times as high as those of B-cells (C-cells). For each quality cell, the average enlistment bonus offered to recruits is added to our estimate of the cost of recruiters' time.[11]

Table 2. Average variable recruiting costs, FY02 ($)

| Budget item | Nuclear field | Other A-cells | B-cells | C-cells |
|---|---|---|---|---|
| Recruiters | 8,176 | 8,176 | 1,635 | 4,088 |
| Enlistment bonuses | 9,811 | 3,248 | 2,221 | 1,725 |
| Navy College Fund | 1,622 | 3,945 | 9 | 0 |
| Loan repayment program | 4 | 4 | 0 | 0 |
| **Total** | **19,613** | **15,373** | **3,865** | **5,813** |

9. Reference [5] estimates differentials for low- and high-quality enlistments similar to those in [7].

10. To highlight differences in cost, average costs are calculated separately for recruits into the nuclear field and all other A-cell recruits.

11. Measures of the amount of EB and NCF offered to Sailors in each rating are based only on recruits who attain the rating they were initially promised. If a person begins training in a particular rating's pipeline but eventually attains a different rating, he or she does *not* receive the EB or NCF promised at the time of enlistment. Including these amounts (i.e., zero EB and NCF) would artificially lower estimates of the cost to recruit a person into a particular rating. The average cost of the loan repayment program is calculated in the same way. Note, however, that very few take part in this program.

Calculating the average cost of the NCF is slightly more complicated. These costs depend on both the average amount promised to a recruit and the proportion of people who eventually take advantage of the benefit. According to the Director, MPN Financial Management Division (N10), 36.8 percent of all promised NCF dollars are eventually used by enlisted personnel. This estimate is a Navy-wide average and does not vary by quality cell, so we use 36.8 percent of the promised NCF dollars in our estimate of average costs.[12]

## Marginal costs of recruiting

Rating-specific recruiting costs will vary for two reasons. First, each rating brings in a different quality mix of recruits. Consequently, ratings with a higher proportion of high-quality accessions (e.g., A-cells) will have higher recruiting costs than those that access lower-quality recruits. Second, the amount of EBs and eligibility for the NCF program differ by rating. Therefore, ratings that bring in the same quality mix of accessions will have different recruiting costs if these financial incentives differ.

In addition, the costs on which we wish to focus are marginal costs. In general, the marginal cost of raising accessions will be higher than the average cost. All else equal, the Navy has to devote more resources to recruiting if it wishes to attract more accessions. When more recruits are needed, a straightforward way for the Navy to achieve this goal is to increase the number of recruiters.

Marginal costs are greater than average costs, then, because one additional recruit requires more recruiter time than the previous accession. This can occur either because the population of potential recruits is smaller or because this smaller population has a lower propensity to join the Navy.

The degree to which the Navy must devote additional recruiters to increase accessions depends on the empirical relationship between the numbers of recruiters and accessions. We estimate this relationship by examining NRD-level data on the number of A-cell accessions,

12. C-cell recruits do not qualify for the Navy College Fund.

the number of recruiters, and civilian employment opportunities from FY92-01. Using this framework, we estimate that a 1-percent increase in the number of recruiters raises the number of A-cell enlistments by 0.9 percent.[13] This implies, on average, a marginal cost of $24,300 for someone entering the nuclear field and of $20,000 for an A-cell recruit.

The cases of B- and C-cell recruits, however, are different from A-cell recruits. Most of the literature assumes that no additional compensation is required to recruit additional B- and C-cell recruits.[14] This does not suggest that such recruits are "free"; they still require time to recruit and still receive some bonuses. However, we assume that the Navy can make small increases to the number of B- and C-cell recruits without changing compensation or the level of effort it takes to recruit them. In other words, for these groups, marginal cost is equal to average cost.

Table 3 presents marginal recruiting costs, both for the Navy as a whole and for a few selected ratings.[15] As table 3 indicates, the marginal cost of one additional recruit is about $15,900. There is, however, a considerable amount of variation around this average. At one extreme, Cryptologic Technicians–Interpreter/Linguists (CTIs) and Electronics Technicians (ETs) have a marginal cost of around $22,000; marginal costs for recruits into the nuclear field are even higher. At the other extreme, marginal costs for Yeomen (YNs) and Mess Management Specialists (MSs) are about $11,000 per additional recruit.

---

13. Appendix C contains a discussion of our enlistment model.

14. For example, reference [6] examines the Navy's increased cap on non-high-school graduates. Its results suggest that the Navy turns away potential B-cell recruits; consequently, it is possible to increase the number of B-cell recruits at current levels of compensation. We assume this is true of C-cell recruits as well.

15. Data for all ratings appear in appendix A.

Table 3. Marginal recruiting costs ($)

| Rating | Marginal cost |
|---|---|
| Navy-wide | 15,878 |
| Cryptologic Technician–Interpreter/Linguist (CTI) | 23,097 |
| Electronics Technician (ET) | 21,812 |
| Yeoman (YN) | 11,968 |
| Mess Management Specialist (MS) | 10,363 |

# Training cost savings

Another implication of higher reenlistment and fewer accessions is that fewer people require training. Consequently, it is necessary to estimate the training cost savings that arise from higher reenlistment. To focus on the change in expenditures that results from marginal changes in the student load, these costs are also disaggregated into variable and fixed costs.

Training costs vary by rating primarily because of differences in the length of the training pipeline. Some ratings require a tremendous amount of instruction to produce qualified Sailors; other ratings require virtually no skill-specific training. To a lesser extent, differences in class size, materials, and the training infrastructure also contribute to differences in training costs across ratings.

## Fixed and variable costs

To calculate marginal training costs, it is necessary to separate training costs into fixed and variable costs. For marginal changes in the number of Sailors that require training, expenditures on infrastructure are not expected to change; we consider these to be fixed costs. In fact, there are only three types of training costs that we consider to be variable: training materials, instructor salaries, and student salaries while in training. We do not have accurate data on per-pupil expenditures for materials; however, these costs are likely to be of secondary importance. Therefore, the two variable costs on which we focus are instructor salaries and the size of the Individuals Account.

## Average variable costs of training

The overwhelming majority of variable training costs are captured in the Individuals Account, which is used to pay student salaries while in training. The principal determinant of these costs is the length of a rating's training pipeline: the longer one spends under instruction, the longer the time one spends receiving a salary while a student, and the higher the training cost. Course duration, however, is not the only source of variation. Ratings differ in the amount of time people spend waiting for instruction to begin, the extent to which pipelines are "interrupted" by holidays, and the time spent waiting for transfer once instruction is complete. All of these components are considered "training costs" and increase the amount the Navy can expect to save with higher reenlistment (or can expect to spend if reenlistment falls).

To accurately estimate the typical length of a rating's pipeline, we focus on all Sailors who attain the rating they were promised when they entered the Navy. This understates the actual amount of time that Sailors spend in training because some begin training in one specialty but eventually attain another rating. From the Navy's perspective, however, our measure of a rating's training pipeline reflects the amount of time one expects a Sailor to spend in training for a particular specialty. Variation in the length of training pipeline, then, comes from differences in the actual amount of training required for an individual rating, and not differences in the rate at which Sailors fail to complete training.

As an example of this variation, table 4 contains the average number of days awaiting instruction, under instruction, in interrupted instruction, and awaiting transfer—for the Navy as a whole, and for a few selected ratings.[16] As table 4 shows, Sailors spend, on average, nearly 300 days in training.[17] Most of this time (249 days, or 87 percent) is spent actually under instruction.

16. Data for all ratings appear in appendix A.

17. "Days in training" are calendar days rather than actual class days. Thus, the average person spends roughly 36 weeks under instruction.

There are some significant differences, however, from one rating to the next. In technical ratings, such as Fire Controlman (FC) and Electronics Technician (ET), Sailors can expect to spend more than 400 days under instruction, and an additional 70 to 80 days awaiting instruction, in interrupted instruction, or awaiting transfer. In contrast, less technical ratings, such as Storekeeper (SK) and Mess Management Specialist (MS), have significantly shorter courses, and also spend significantly shorter periods of time in training categories other than instruction.

Table 4. Average number of days in training[a]

| Rating | Awaiting instruction | Under instruction | Interrupted instruction | Awaiting transfer | Total |
|---|---|---|---|---|---|
| Navy-wide | 23 | 249 | 8 | 7 | 287 |
| Fire Controlman (FC) | 40 | 492 | 25 | 8 | 565 |
| Electronics Technician (ET) | 40 | 413 | 17 | 21 | 491 |
| Storekeeper (SK) | 12 | 127 | 4 | 3 | 146 |
| Mess Management Specialist (MS) | 8 | 123 | 2 | 1 | 134 |

a. Sample includes all who receive the rating they were initially promised and do not attrite. Time in boot camp is included in total training time.

Beyond the length of the training pipeline, class sizes vary by rating as well. Larger class sizes imply a larger student-to-teacher ratio, which translates into smaller per-student instructor costs. Table 5 lists the average class size for the same ratings considered in table 4.

The average class size is about 26 students. Again, the variation by rating is notable. In table 5, the technical ratings have significantly larger class sizes than the nontechnical ratings. If we look at all classes, however, there is *no* relationship between length of training pipeline and the number of students per instructor. The data in table 5, therefore, only suggest that per-student expenditures on instructor salaries will vary by rating as well.

Table 5. Average class size[a]

| Rating | Average class size |
|---|---|
| Navy-wide | 25.7 |
| Fire Controlman (FC) | 32.3 |
| Electronics Technician (ET) | 41.2 |
| Storekeeper (SK) | 13.1 |
| Mess Management Specialist (MS) | 16.0 |

a. Data are for all classes following boot camp and include all Sailors attending a class.

## Marginal costs of training

It is straightforward to calculate average training costs by rating from the data in tables 4 and 5. Student salaries while in training are multiplied by the number of days in training, and instructor salaries are multiplied by the number of days under instruction and divided by the average class size.[18] In general, the marginal cost of training more people will only differ from these average costs if some determinant of cost varies with the number of students in the training pipeline.

Two components of training costs potentially vary with student load. The first is the requirement for instructors. Any variation in costs is caused by the fact that the Navy cannot "marginally" increase the number of instructors. Consequently, our estimates of marginal training costs do not vary because of changing requirements for instructors.[19] The second component of cost that we consider is the amount of time awaiting instruction. For classes that are already filled to capacity, more people in the training pipeline will increase time

18. In addition, we consider the cost of boot camp as a training cost. However, the length of boot camp is the same for all ratings, so none of the variation in training costs is because of boot camp.

19. Our estimates implicitly assume that the Navy has "optimal" class sizes. If desired class size is larger (smaller) than what we observe, average training costs from instructor salaries would be smaller (larger) than our estimates. Although we suspect that the optimal class size is larger for some ratings and smaller for others, we do not have an objective framework with which to evaluate a desired student-to-instructor ratio.

awaiting instruction (i.e., waiting for classroom space or for a new class to begin). For classes that are not filled to capacity, however, we expect a negative relationship between number of accessions and time awaiting instruction. To quantify this relationship, we estimate the effect of changes in class size on time awaiting instruction, controlling for several other observable characteristics. Even though our estimates are consistent with this intuition, the number of days awaiting instruction is small, and the marginal changes to the number of days awaiting instruction is even smaller (see appendix C for more details on these results). Consequently, the marginal costs of training are extremely close to the average variable costs of training. For simplicity, then, we use average training costs in our analysis.

Table 6 presents the average costs of training for the Navy as a whole and a few selected ratings.[20] On average, it costs the Navy about $27,000 to train a recruit. As table 4 suggested, however, highly technical ratings (with more days under instruction) have higher training costs than less technical ratings. For example, it costs over $50,000 to train an FC, but only about $13,000 to train an MS or an SK.

Table 6. Average costs of training ($)

| Rating | Average cost |
|---|---|
| Navy-wide | 26,733 |
| Fire Controlman (FC) | 51,215 |
| Electronics Technician (ET) | 44,360 |
| Storekeeper (SK) | 13,613 |
| Mess Management Specialist (MS) | 12,284 |

## Value of additional experience

Higher reenlistment implies a more senior force. In general, the Navy benefits from a more experienced workforce if the relationship between seniority and readiness is positive. Although difficult to quantify, previous research indicates that such a relationship does

20. Data for all ratings appear in appendix A.

exist [8]. Furthermore, the connection between experience and readiness is an intuitive one. More experienced Sailors are more immersed in the Navy culture, have been working longer in their specialties, and have likely learned how to perform their duties more effectively.

Unfortunately, it is extremely difficult to measure the relationship between experience and readiness, and placing a dollar value on a "readiness benefit" requires strong assumptions. The most straightforward approach is to assume that the value of experience to the Navy mirrors the value to employers in comparable civilian occupations. In addition, assume that the value to employers in civilian occupations mirrors the extent to which these employers are willing to pay for additional experience. In other words, if an employer pays salaries that are 5 percent higher for every year of experience, the value to that employer of an additional year of experience is assumed to be 5 percent.

Although this approach is straightforward, it relies on a few tenuous assumptions. First, the correlation between salary and productivity is probably not perfect. For example, heavily unionized industries have wage-experience profiles that differ from the conventional wisdom about productivity growth over one's career. Substantial evidence suggests that unionized jobs pay a premium to workers (see, e.g., [9] as well as [10]). Even in other industries, compensation might rise faster or slower than productivity for a number of reasons.[21]

Second, the list of civilian occupations that are "comparable" to Navy ratings is not large. Some ratings have clear civilian counterparts [12], but many do not.[22] Furthermore, the tasks performed in the Navy, even when similar, are never identical to the tasks performed in similar civilian jobs. Different technologies, work environments, and interactions with people in different specialties all reduce the comparability between military and civilian jobs.

---

21. For example, if firms have made investments in training employees, wage growth will typically differ from productivity growth. See [11].

22. In principle, one could restrict attention to ratings with clear civilian counterparts; however, this approach would prevent us from estimating reenlistment goals for all ratings.

Despite these difficulties, civilian wage growth is an objective measure of the benefits to the Navy of a more experienced workforce. Rather than rely on a tenuous correspondence between Navy ratings and comparable civilian occupations, we separate both groups broadly into technical and nontechnical jobs.[23] Using the Current Population Surveys, we then estimate the returns to experience in technical and nontechnical civilian occupations.[24] Based on these data, we estimate that civilian employers expect increases in productivity of 4.3 and 3.7 percent for every additional year of experience in technical and nontechnical occupations, respectively.

Assuming that the benefits to the Navy are comparable to those in the private sector, productivity improves by 4.3 (3.7) percent for every additional year of service in a technical (or nontechnical) rating. Table 7 summarizes the value of this additional experience to the Navy for a few selected ratings.[25] These data are expressed in terms of a 1-percentage-point increase in reenlistment for a given rating.

Table 7. Value of additional experience—1-percentage-point increase in reenlistment

| Rating | Dollar value per man-year | Initial years of service | New years of service |
|---|---|---|---|
| **Technical** | | | |
| Electronics Technician (ET) | 1,965 | 6.16 | 6.19 |
| Fire Controlman (FC) | 1,916 | 6.35 | 6.39 |
| Machinist's Mate (MM) | 1,901 | 5.91 | 5.95 |
| **Nontechnical** | | | |
| Yeoman (YN) | 1,681 | 6.96 | 7.00 |
| Mess Management Specialist (MS) | 1,677 | 6.12 | 6.16 |
| Storekeeper (SK) | 1,670 | 6.91 | 6.96 |

23. See [13] for the classification of Navy ratings and civilian occupations into technical and nontechnical occupations.

24. Appendix C contains a discussion of these estimates.

25. Data for all ratings appear in appendix A.

For example, a 1-percentage-point increase in reenlistment of ETs raises their average years of service from 6.15 to 6.19. This increase in seniority is worth about $1,965 per additional year of service per Sailor. In contrast, an identical increase in reenlistment of MSs is worth about $1,677 per additional year of service per Sailor. As table 7 demonstrates, the value to the Navy of additional experience is higher in technical than in nontechnical ratings. This additional experience does not translate into tangible dollars that the Navy could choose to spend on other resources; these dollars merely represent the value of the additional experience to the Navy.

## Marginal benefits of higher reenlistment

Having examined the primary benefits to the Navy of higher reenlistment, we can now quantify the benefit of raising reenlistment on a rating-by-rating basis. Table 8 presents the benefit to the Navy of raising reenlistment by 1 percentage point for a few selected ratings.[26] We list the value of each benefit separately, as well as the total benefit of raising reenlistment. For clarity, the final column presents this total benefit as the value to the Navy per additional reenlistment.

Table 8. Marginal benefits of a 1-percentage-point increase in reenlistment

| Rating | Additional reenlistments | Recruiting ($K) | Training ($K) | Experience ($K) | Total ($M) | Total per reenlistment ($K) |
|---|---|---|---|---|---|---|
| Fire Controlman (FC) | 8 | 2.20 | 5.38 | 5.96 | 1.35 | 1.80 |
| Electronics Technician (ET) | 12 | 3.66 | 7.45 | 9.06 | 2.02 | 1.68 |
| Machinist's Mate (MM) | 12 | 2.19 | 4.43 | 8.98 | 1.56 | 1.30 |
| Storekeeper (SK) | 6 | 1.27 | 1.05 | 4.23 | 0.65 | 1.19 |
| Yeoman (YN) | 7 | 1.09 | 1.27 | 4.98 | 0.73 | 1.13 |
| Mess Management Specialist (MS) | 10 | 1.38 | 1.63 | 6.32 | 0.93 | .98 |

26. Data for all ratings appear in appendix A.

For example, a 1-percentage-point increase in reenlistment of ETs yields about 12 additional Sailors for the Navy; this allows the Navy to recruit and train about 17 fewer people (12*1.4 = 16.8). As a result, the Navy saves about $365,000 in recruiting and $745,000 in training costs. In addition, this increase in reenlistment increases the seniority of the ET rating; we estimate the value of this additional experience to be about $900,000. A 1-percentage-point increase in reenlistment of ETs, then, generates about $2 million in benefits for the Navy, or about $170,000 per additional reenlistment.

The benefits of higher reenlistment in other ratings have a similar interpretation. As table 8 suggests, ratings with relatively high recruiting and/or training costs (e.g., FC, ET) yield the most benefits to the Navy per additional reenlistment. In contrast, a nontechnical rating with low recruiting and training costs (e.g., MS) generates relatively little benefit to the Navy.

While these benefits appear large, it is important to note that they *do not necessarily* imply that higher reenlistment is a cost-effective option for the Navy. As the next section discusses, there are also sizable costs associated with higher reenlistment. Raising reenlistment rates in a rating is only cost-effective if the benefits presented here outweigh those costs.

# Costs of higher reenlistment

Despite sizable benefits to the Navy, higher reenlistment is not without cost. Holding all else constant, the Navy must offer financial incentives to Sailors to encourage additional reenlistment. These additional incentives raise the cost of reenlistment. In addition, portions of enlisted compensation vary with both length of service and dependency status. A more senior force implies an increase in these "seniority costs." We examine each of these costs separately, before calculating the marginal costs of higher reenlistment.

## Expenditures on reenlistment incentives

The use of incentives to "buy" reenlistment is the most visible cost of higher reenlistment. Holding all else constant, the Navy typically offers bonuses to Sailors in specific ratings in order to encourage higher reenlistment in these ratings. These selective reenlistment bonuses (SRBs) are paid to all those in a particular rating who choose to reenlist for at least 36 additional months. Ultimately, the amount of reenlistment that the Navy can buy for a given increase in SRBs depends on individual responsiveness to changes in compensation. If Sailors require significant increases in pay before deciding to reenlist, expenditures on incentives will be extremely large for a given increase in reenlistment. Consequently, we require estimates of the relationship between compensation and reenlistment.

### Sailor responsiveness to changes in compensation

A substantial body of literature examines the relationship between changes in relative compensation and changes in reenlistment behavior. The literature often focuses on estimating the magnitude of this relationship, controlling for other factors that affect the reenlistment decision. This empirical approach produces estimates of a *pay elasticity of reenlistment,* which measures the percentage change in reenlistment associated with a 1-percent increase in pay. Alternatively, this relationship is also characterized by the *SRB effect on reenlistment,*

which measures the percentage-point change in reenlistment associated with a 1-level increase in the SRB multiplier.

Although estimates of this relationship have shown a decline over the past 30 years [14], reference [3] shows that most of the variation in the literature is explained by differences in researchers' methodologies. Further, the authors of [3] conclude that their model with a pay elasticity of 1.5, and an SRB effect of 2.5 percentage points, provides the best "fit" of the data on Navy enlisted personnel. Consequently, we use this estimate of Sailor responsiveness to compensation in calculating the costs of higher reenlistment.

The main advantage of this estimate is that it comes from a model that accurately predicts reenlistment. The primary disadvantage, however, is that it is an "average" effect across all ratings. Using a Navy-wide average will still result in differences in the marginal costs of higher reenlistment because current reenlistment and SRB levels differ by rating. Assuming the same response to pay for all ratings, however, minimizes the variation in costs.

There is some evidence that responsiveness to pay does vary by rating. Reference [15] argues that working conditions vary significantly from one Navy occupation to the next, and that these differences generate different responses to the same increase in pay. Similarly, it is likely that civilian opportunities also vary by rating. Reference [3] estimates the effect of compensation for 16 different occupation groups; these results are reproduced in table 9.[27]

As table 9 shows, estimates of the SRB effect on reenlistment range considerably, from 0 (Construction) to 6.1 percentage points (Ship Maintenance). Unfortunately, [3] does not evaluate the relative performance of this model of reenlistment behavior (i.e., occupation-specific effects of compensation) because it is not comparable to the other models on which the authors focus.[28] Our analysis indicates

27. See appendix B of [3] for a complete listing of the individual ratings that make up each category.

28. The results from table 9 are calculated from separate regressions for each of the occupation groups listed in column 1. Each regression, then, has its own "goodness of fit" and ability to forecast reenlistment.

that a model with a single pay elasticity of reenlistment does a better job of predicting behavior than models with occupation-specific elasticities. Consequently, we focus on estimates of reenlistment goals that utilize this single relationship between pay and reenlistment. However, we also calculate reenlistment goals using the occupation-specific effects; these results are discussed in appendix B.

Table 9. Occupation-specific effects of compensation[a]

| Rating | SRB effect (percentage points) |
|---|---|
| Seabee Construction | 0[b] |
| Non-Seabee Construction | 0[b] |
| Marine Engineering | 4.2 |
| Ship Maintenance | 6.1 |
| Aviation Maintenance | 1.3 |
| Aviation Ground Support | 0.6 |
| Media | 2.1 |
| Logistics | 4.8 |
| Administration | 4.1 |
| Data Systems | 3.2 |
| General Seamanship | 4.5 |
| Health Care | 3.7 |
| Cryptology | 0.6 |
| Ordnance Systems | 0.7 |
| Communications/Sensor | 3.1 |
| Weapons Systems/Control | 2.8 |

a. Reproduced from table 7 of [3].
b. No significant effect of pay on reenlistment

## Marginal cost of reenlistment incentives

The marginal costs of increasing reenlistment by offering SRBs vary by rating for two reasons. First, ratings already have different reenlistment bonus levels. Ratings with large existing bonuses will have higher marginal costs because the new reenlistments in these ratings receive more compensation than new reenlistments in other ratings. Second, current reenlistment rates also vary by rating. Even though higher bonuses encourage additional reenlistment, they must be paid

to all individuals making reenlistment decisions. The Navy cannot determine who would have reenlisted without the higher bonus, so it must offer these higher bonuses to all who are eligible to reenlist. Consequently, many Sailors receive higher bonuses than are really necessary to retain them. Higher initial reenlistment rates imply that, for a given increase in reenlistment, more people are receiving these higher bonuses. This increases the marginal cost, and decreases the cost-effectiveness, of higher reenlistment.

The size of the SRB also depends on three characteristics of the person who chooses to reenlist: paygrade, length of service at time of reenlistment, and length of reenlistment contract. In principle, these factors can vary by rating, but they are likely to be of second-order importance. For simplicity, we assume that all Sailors making reenlistment decisions are E-4s in their 4th year of service, and that all reenlistment contracts are 4 years in duration.[29]

Table 10 presents the marginal cost of reenlistment incentives incurred by the Navy if it were to raise reenlistment in a few selected ratings.[30] For each rating, these costs are expressed in terms of a 1-percentage-point increase in reenlistment; we present both the total cost and the cost per additional reenlistment. Table 10 also contains the FY01 reenlistment rate and SRB multiplier associated with that rating. These estimates assume that Sailors currently extending their contracts do not formally reenlist.

The data in table 10 reveal several features of the marginal cost of offering reenlistment incentives to encourage higher reenlistment. For example, ratings with higher initial SRBs have higher marginal costs. Machinist's Mates and Yeomen have identical reenlistment rates; MMs, however, have an SRB multiplier of 2, and YNs are not currently offered a bonus. Consequently, the cost per additional reenlistment is higher for MMs.

---

29. For all ratings, the median person at the first reenlistment point is an E-4. Although more technical ratings have a higher proportion of Sailors in higher paygrades than less technical ratings, the E-4 paygrade is still the most prevalent.

30. Data for all ratings appear in appendix A.

Table 10. Marginal cost of reenlistment incentives—1-percentage-point reenlistment increase

| Rating | Reenlistment rate | SRB multiplier | Additional expenditures ($M) | Dollar cost per reenlistment ($M) |
|---|---|---|---|---|
| Fire Controlman (FC) | 0.76 | 5 | 1.9 | .253 |
| Electronics Technician (ET) | 0.78 | 5 | 3.1 | .257 |
| Machinist's Mate (MM) | 0.51 | 2 | 1.9 | .158 |
| Storekeeper (SK) | 0.57 | 0 | .8 | .151 |
| Yeoman (YN) | 0.51 | 0 | .9 | .140 |
| Mess Management Specialist (MS) | 0.49 | 0 | 1.3 | .135 |

Table 10 also shows that ratings with already high reenlistment have higher marginal costs. For example, FCs and ETs are offered the same SRB, but the reenlistment rate for Electronics Technicians is slightly higher. When SRBs are increased, therefore, more ETs than FCs are receiving a larger bonus than necessary for them to remain in the Navy. As a result, the marginal cost per additional reenlistment is higher for ETs.

## Seniority costs

The final costs of higher reenlistment that we consider are "seniority costs," the portions of enlisted compensation that vary with length of service and/or dependency status. Higher reenlistment implies a more senior force that, by definition, is composed of Sailors with greater length of service. All components of compensation that rise with length of service generate a larger wage bill to the Navy when reenlistment increases. Similarly, some pays vary by dependency status; because more senior personnel are more likely to have dependents, these pays are also considered seniority costs.

Several sizable components of MPN (Military Personnel, Navy) can be considered seniority costs. The first is basic pay, which varies not only by paygrade but also by length of service. Calculating the increase in basic pay due to higher reenlistment is straightforward because the pay tables explicitly delineate the relationship between basic pay and length of service. Second, allowances for both housing (BAH) and subsistence (BAS) vary by both length of service and dependency status. These relationships are also well documented.

The final seniority costs that we consider are set-asides for retirement and health care. The costs of health care can be separated into two parts: health care for current enlisted personnel, and set-asides for retiree health care. According to [16], however, current health care expenditures are not disaggregated by paygrade, length of service, or dependency status; in fact, these costs are not even calculated separately for officers and enlisted personnel. Consequently, we do not consider current health care expenditures to be seniority costs.

Set-asides for retirement and retiree health care are determined by DoD's Office of the Actuary. According to [17], the Services are required to set aside 26.9 percent of basic pay for pension benefits, and 29.6 percent of basic pay for retiree health care. These percentages are not calculated separately by Service, for officers and enlisted personnel, or for those with and without dependents. Set-asides, then, only vary by paygrade and length of service because it is across these dimensions that basic pay varies.

For large enough increases in reenlistment, it is probable that the Office of the Actuary would revise these set-aside rates. Higher reenlistment of a cohort increases the proportion of that cohort that will likely become vested in their military pensions; more retirees will increase the cost of providing these pensions. In a steady state, then, dramatically higher (lower) reenlistment would require a different set-aside percentage to fund retirees' pensions. If our cost-benefit analysis generates reenlistment goals that are substantively different from current rates, it is possible that using the current set-aside rates will not accurately reflect the cost of higher reenlistment.[31]

The set-aside rate, is a single number based on the aggregate behavior of all four Services. Thus, a dramatic increase (decrease) in Navy reenlistment would affect the set-aside requirements, but by substantially less than if all four Services had a similar change in reenlistment. Furthermore, it is unlikely that DoD would "penalize" the Navy for higher reenlistment by requiring a higher set-aside rate. The Air Force and the Marine Corps currently set aside the same proportion of basic pay

31. If our analysis suggests steady-state reenlistment goals that are higher for some ratings and lower for others, however, this is not an issue.

for retirees, despite the fact that reenlistment patterns in these two Services are different. Similarly, officers and enlisted personnel have different reenlistment rates but identical set-aside rates. Therefore, we use the current set-aside percentages in our analysis, regardless of the level of reenlistment we examine.

Finally, the overwhelming majority of health care costs are paid out of OSD Health Affairs funds and are not a cost to the Navy [18]. Consequently, we do not consider health care costs as a cost of higher reenlistment to the Navy.[32] Our analysis measures the costs and benefits of reenlistment to the Navy, not to DoD or to the U.S. Treasury.[33] As long as DoD does not penalize the Navy for higher reenlistment by requiring that it begin to pay retiree health costs directly, these are not costs to the Navy.

Our estimates of seniority costs, then, are the increases in basic pay, allowances for housing and subsistence, and set-asides for retirement due to a more experienced workforce. At the same time, we restrict the paygrade mix of this more senior force to be identical to the steady-state force. In general, more experienced people are at higher paygrades, so an unconstrained model would predict that a more senior force would have a higher proportion of enlisted personnel in the top paygrades. For the relatively modest changes in reenlistment that we consider, however, it is not likely that the Navy would substantively increase promotion rates.

Using the steady-state model of continuation behavior developed by [2], we estimate that a 1-percentage-point increase in zone A reenlistment would increase the average seniority of the enlisted force by about 0.5 month.[34] This increase in seniority would cost the Navy about $10 million in seniority costs, or about $800 per additional year

32. Although [18] notes that these costs are not paid out of Navy funds, the authors still include these expenditures as costs of higher reenlistment.

33. If we were measuring costs to the Treasury, we would also have to factor in the tax advantage that accrues to enlisted personnel.

34. Average years of service increase slightly, from 6.57 to 6.61. For comparison, [1] estimates that a 2-percentage-point increase in zone A reenlistment would increase average seniority by 1.2 months.

of service per Sailor. About 10 percent of this increase results from the positive relationship between length of service and the probability that one has dependents; the overwhelming majority of the rise in seniority costs is because of the higher pay associated with longer lengths of service.

Estimates of rating-specific seniority costs vary from this Navy-wide average because some ratings are more senior than others. As an example, table 11 presents the increase in seniority costs, calculated per additional year of service, for a 1-percentage-point increase in reenlistment for a few ratings.[35] Again, there is some variation by rating in the increase in seniority costs per man-year of service. This variation is the result of differences in the length-of-service profile from one rating to the next.

Table 11. Increase in seniority costs—1-percentage-point increase in reenlistment

| Rating | Initial years of service | New years of service | Cost per man-year ($) |
|---|---|---|---|
| Electronics Technician (ET) | 6.16 | 6.19 | 830 |
| Fire Controlman (FC) | 6.35 | 6.39 | 798 |
| Machinist's Mate (MM) | 5.91 | 5.95 | 673 |
| Yeoman (YN) | 6.96 | 7.00 | 786 |
| Mess Management Specialist (MS) | 6.12 | 6.16 | 688 |
| Storekeeper (SK) | 6.91 | 6.96 | 762 |

## Marginal costs of higher reenlistment

Having examined the primary costs to the Navy of higher reenlistment, we can quantify the cost to the Navy of raising reenlistment on a rating-by-rating basis. Table 12 presents the cost of raising reenlistment by 1 percentage point for selected ratings.[36] We list the magnitude of each component of cost separately, as well as the total cost of

35. Data for all ratings appear in appendix A.

36. Data for all ratings appear in appendix A.

raising reenlistment. For clarity, the final column presents this total cost as the amount the Navy spends per additional reenlistment.

Table 12. Marginal costs of a 1-percentage-point increase in reenlistment ($M)

| Rating | Reenlistment expenditures | Seniority costs | Total | Total per reenlistment |
|---|---|---|---|---|
| Fire Controlman (FC) | 1.9 | .25 | 2.1 | .29 |
| Electronics Technician (ET) | 3.1 | .38 | 3.5 | .29 |
| Machinist's Mate (MM) | 1.9 | .32 | 2.2 | .18 |
| Storekeeper (SK) | .8 | .19 | 1.0 | .19 |
| Yeoman (YN) | .9 | .23 | 1.1 | .18 |
| Mess Management Specialist (MS) | 1.3 | .26 | 1.5 | .16 |

For example, a 1-percentage-point increase in reenlistment of ETs yields about 12 additional Sailors for the Navy. To achieve this increase in retention, the Navy spends about $3.1 million in reenlistment incentives targeted at this rating. This increase in reenlistment also increases the seniority of the ET rating; we estimate the costs associated with this seniority to be about $380,000. A 1-percentage-point increase in reenlistment of ETs, then, costs about $3.5 million to the Navy, or about $290,000 per additional reenlistment. The costs of higher reenlistment in other ratings have a similar interpretation.

# Rating-specific reenlistment goals

Using these estimates of the costs and benefits of reenlistment, we can now calculate rating-specific reenlistment goals. Ratings can be broadly classified into (a) ratings for which the benefits of an increase in reenlistment are greater than the costs and (b) ratings for which the costs exceed the benefits. If the benefits of higher reenlistment are greater than the costs, we know that reenlistment should be higher than its current level. To determine the reenlistment goal, we raise the reenlistment rate by increasing the SRB for that rating and then recalculate benefits and costs at this new, higher rate. We continue to increase the SRB and reenlistment rate for this rating until benefits no longer exceed costs. The point at which the benefits of higher reenlistment equal the costs is the reenlistment goal for this rating. If the costs exceed the benefits for a rating, the reenlistment rate is lowered in a similar fashion until costs equal benefits.

Table 13 presents rating-specific reenlistment goals. For each rating, columns 2 and 3 list the steady-state (FY01) reenlistment level and SRB multiplier. Column 4 lists the reenlistment goal, and column 5 presents the SRB multiplier necessary to achieve this goal. As the first row of table 13 indicates, the FY01 zone A reenlistment rate for the Navy is 58.4 percent. Our cost-benefit analysis implies a zone A reenlistment goal of 53.5 percent, a reduction of about 5 percentage points, or 8 percent.

Table 13. Rating-specific reenlistment goals

| Rating | FY01 reenlistment rate | FY01 SRB multiplier | New reenlistment rate (goal) | New SRB multiplier |
|---|---|---|---|---|
| **Navy-wide** | **0.584** | | **0.535** | |
| | Group 1: Increase in reenlistment | | | |
| CTI | 0.53 | 5.5 | 0.58 | 7.5 |
| EM | 0.44 | 0 | 0.47 | 1.0 |

Table 13. Rating-specific reenlistment goals (continued)

| Rating | FY01 reenlistment rate | FY01 SRB multiplier | New reenlistment rate (goal) | New SRB multiplier |
|---|---|---|---|---|
| GM | 0.43 | 0 | 0.44 | 0.5 |
| MU | 0.64 | 0 | 0.66 | 0.5 |
| Group 2: Decrease in reenlistment, positive SRB | | | | |
| AT | 0.48 | 3.5 | 0.41 | 0.5 |
| AW | 0.45 | 2.5 | 0.42 | 1.5 |
| CTR | 0.57 | 4.5 | 0.47 | 0.5 |
| ET (NF) | 0.70 | 7.5 | 0.57 | 2.0 |
| EW | 0.58 | 3.0 | 0.52 | 0.5 |
| Group 3: Decrease in reenlistment, no SRB | | | | |
| ABE | 0.53 | 2.5 | 0.47 | 0.0 |
| ABF | 0.56 | 2.5 | 0.50 | 0.0 |
| AC | 0.72 | 2.5 | 0.66 | 0.0 |
| AD | 0.62 | 1.0 | 0.60 | 0.0 |
| AE | 0.52 | 2.0 | 0.47 | 0.0 |
| AG | 0.48 | 0.5 | 0.46 | 0.0 |
| AME | 0.63 | 3.5 | 0.54 | 0.0 |
| AMH | 0.61 | 3.0 | 0.53 | 0.0 |
| AMS | 0.60 | 3.0 | 0.53 | 0.0 |
| AO | 0.53 | 3.0 | 0.45 | 0.0 |
| BU | 0.61 | 1.0 | 0.59 | 0.0 |
| CE | 0.64 | 0.5 | 0.63 | 0.0 |
| CM | 0.57 | 1.0 | 0.55 | 0.0 |
| CTA | 0.69 | 0.5 | 0.67 | 0.0 |
| CTM | 0.74 | 1.5 | 0.70 | 0.0 |
| CTO | 0.61 | 4.0 | 0.51 | 0.0 |
| CTT | 0.48 | 3.5 | 0.40 | 0.0 |
| DC | 0.47 | 0.5 | 0.45 | 0.0 |
| DK | 0.68 | 0.5 | 0.66 | 0.0 |
| EA | 0.73 | 2.0 | 0.68 | 0.0 |
| EM (NF) | 0.78 | 6.5 | 0.62 | 0.0 |
| EN | 0.52 | 1.0 | 0.50 | 0.0 |
| EO | 0.49 | 1.0 | 0.47 | 0.0 |
| ET | 0.79 | 5.0 | 0.66 | 0.0 |
| FC | 0.77 | 5.0 | 0.64 | 0.0 |
| FT | 0.83 | 5.0 | 0.70 | 0.0 |
| GSE | 0.45 | 1.5 | 0.41 | 0.0 |
| GSM | 0.51 | 1.5 | 0.47 | 0.0 |

Table 13. Rating-specific reenlistment goals (continued)

| Rating | FY01 reenlistment rate | FY01 SRB multiplier | New reenlistment rate (goal) | New SRB multiplier |
|---|---|---|---|---|
| HT | 0.50 | 1.0 | 0.48 | 0.0 |
| IC | 0.42 | 1.0 | 0.40 | 0.0 |
| IS | 0.49 | 3.0 | 0.42 | 0.0 |
| IT | 0.45 | 3.0 | 0.37 | 0.0 |
| MA | 0.83 | 1.5 | 0.79 | 0.0 |
| MM | 0.52 | 2.0 | 0.47 | 0.0 |
| MM (NF) | 0.78 | 6.0 | 0.63 | 0.0 |
| MN | 0.65 | 3.5 | 0.56 | 0.0 |
| MT | 0.88 | 4.5 | 0.76 | 0.0 |
| OS | 0.55 | 2.0 | 0.50 | 0.0 |
| PC | 0.56 | 1.0 | 0.53 | 0.0 |
| PR | 0.70 | 2.0 | 0.65 | 0.0 |
| QM | 0.56 | 2.0 | 0.51 | 0.0 |
| SH | 0.52 | 1.0 | 0.50 | 0.0 |
| SM | 0.58 | 2.0 | 0.53 | 0.0 |
| STG | 0.58 | 3.0 | 0.51 | 0.0 |
| STS | 0.60 | 6.5 | 0.44 | 0.0 |
| SW | 0.61 | 1.5 | 0.57 | 0.0 |
| UT | 0.56 | 1.0 | 0.54 | 0.0 |
| | | Group 4: No change | | |
| ABH | 0.45 | 0.0 | 0.45 | 0.0 |
| AK | 0.60 | 0.0 | 0.60 | 0.0 |
| AS | 0.50 | 0.0 | 0.50 | 0.0 |
| AZ | 0.56 | 0.0 | 0.56 | 0.0 |
| DT | 0.72 | 0.0 | 0.72 | 0.0 |
| HM | 0.58 | 0.0 | 0.58 | 0.0 |
| JO | 0.63 | 0.0 | 0.63 | 0.0 |
| LI | 0.60 | 0.0 | 0.60 | 0.0 |
| MR | 0.48 | 0.0 | 0.48 | 0.0 |
| MS | 0.58 | 0.0 | 0.58 | 0.0 |
| PH | 0.51 | 0.0 | 0.51 | 0.0 |
| PN | 0.72 | 0.0 | 0.72 | 0.0 |
| RP | 0.64 | 0.0 | 0.64 | 0.0 |
| SK | 0.65 | 0.0 | 0.65 | 0.0 |
| TM | 0.43 | 0.0 | 0.43 | 0.0 |
| YN | 0.70 | 0.0 | 0.70 | 0.0 |

Though our analysis indicates that the Navy-wide reenlistment rate is too high, table 13 reveals some notable differences by rating. Ratings can be classified into one of four categories. The first group consists of four ratings in which the reenlistment goal is *higher* than the current reenlistment rate.[37] For example, the CTI rating (Cryptologic Technician – Interpreter/Linguist) has a reenlistment rate of 53 percent, with an SRB multiplier of 5.5. Our cost-benefit analysis suggests a reenlistment goal of 58 percent, with an increase in the SRB multiplier to 7.5. CTIs have some of the largest recruiting and training costs of all the Navy enlisted ratings. Despite high reenlistment bonuses, our estimates suggest that savings from these recruiting and training costs are large enough to offset the increase in SRB expenditures associated with higher reenlistment.

None of the other three ratings with higher reenlistment goals (EM, GM, and MU) are currently offered reenlistment bonuses. EMs and GMs, however, have two notable characteristics that drive the recommended increase in reenlistment. Although both ratings have average recruiting and training costs, they also have relatively low reenlistment rates (44 and 43 percent, respectively). Therefore, offering a reenlistment bonus to Sailors in these ratings results in relatively little "rent" paid to those who would have reenlisted anyway. In other words, a low reenlistment rate results in a relatively low cost of reenlistment. Furthermore, both of these are technical ratings, which implies a large value to the Navy of additional seniority. Finally, for MUs, recruiting costs are sufficiently large to warrant a slight increase in reenlistment.

The second group consists of ratings in which the reenlistment goal is *lower* than current rates, but which are still offered bonuses at the new level of retention. For these ratings, too many Sailors would reenlist even if bonuses were slightly lower than current levels. At some bonus level, however, expenditures on reenlistment incentives are offset by the benefits of higher reenlistment.

---

37. To the extent that increasing the bonus within a rating causes Sailors to choose reenlistment over long-term extension, our results change slightly. In this case, *only* CTIs are currently below their optimal retention level. For the other ratings, the large number of Sailors who opt for reenlistment over extension when bonuses increase eliminates the cost-effectiveness of reenlistment. In this scenario, the Navy's overall retention goal falls slightly, from 53.5 percent to 53.4 percent.

The final two groups of ratings are not offered any reenlistment bonuses at the new reenlistment goals. The third group consists of ratings that are currently offered SRBs. However, our analysis suggests that these bonuses are not cost-effective and that reenlistment should be lower. Furthermore, our analysis implies that no bonus of any size would be cost-effective for these ratings. The final group is not currently offered reenlistment incentives. Because there is no SRB to decrease, the reenlistment goal for each of these ratings is equal to FY01 rates.

For both of these groups of ratings, our analysis suggests that the cost-effective level of reenlistment is *lower* than the reenlistment "goals" we estimate for these ratings. In other words, our reenlistment goals for these ratings are not cost-effective because of our assumption that increases and decreases in reenlistment are achieved by increasing and decreasing reenlistment bonus levels. For ratings without reenlistment bonuses, our assumptions prohibit us from lowering reenlistment any further. However, *if* reenlistment could be lowered by decreasing other forms of compensation (e.g., basic pay), it would be cost-effective for these ratings.

## Why not increase reenlistment in high-tech ratings?

The conclusions from table 13 contrast with those in [1], which recommends an increase in reenlistment for high-tech ratings. For every rating considered "high-tech" in [1], however, our analysis implies that reenlistment should decline. There are two primary reasons for these different recommendations.

First, [1] estimates that a 1-percentage-point increase in reenlistment would increase seniority costs by about $4 million; in contrast, our model predicts an increase in these costs of about $10 million. Even after adjusting for inflation, our estimates of seniority costs are significantly higher. These differences are undoubtedly the result of recent increases in compensation in the E-5 to E-7 paygrades [19].[38] Higher

38. The 9th Quadrennial Review of Military Compensation (QRMC) recommended large, targeted basic pay increases to enlisted personnel in these paygrades with 6 to 20 years of service. These increases, approved by Congress, resulted in a steeper pay profile and increased seniority costs to each of the Services.

seniority costs reduce the return on investment of higher reenlistment and lead to lower reenlistment goals.

Second, an examination of the data used by [1] reveals that our reenlistment goals are not inconsistent with earlier recommendations. For the high-tech ratings discussed in [1], table 14 reproduces our estimates from table 13. In addition, the final two columns of table 14 list the FY99 retention rate and SRB multipliers for these ratings.[39] For each of the ratings listed in table 14, our predicted reenlistment goal is higher than FY99 reenlistment in these ratings, but the FY01 reenlistment rates and bonus levels are higher yet. In other words, both bonuses and reenlistment rates did increase in these ratings after FY99, and some of that increase was cost-effective. Therefore, our goals are consistent with earlier recommendations. However, because FY01 reenlistment rates are, without exception, significantly larger than FY99 rates, further increases in reenlistment are prohibitively expensive. If such increases occurred, additional bonuses would be paid to a large number of Sailors who are willing to reenlist anyway.

Table 14. Comparison of FY99, FY01, and recommended reenlistment rates and SRB multipliers

| Rating | FY01 reenlistment rate | FY01 SRB multiplier | New reenlistment rate (goal) | New SRB multiplier | FY99 reenlistment rate | FY99 SRB multiplier |
|---|---|---|---|---|---|---|
| AT | 0.48 | 3.5 | 0.41 | 0.5 | 0.35 | 3.0 |
| CTM | 0.74 | 1.5 | 0.70 | 0.0 | 0.59 | 0.0 |
| ET | 0.79 | 5.0 | 0.66 | 0.0 | 0.63 | 4.0 |
| ET (NF) | 0.70 | 7.5 | 0.57 | 2.0 | 0.54 | 6.0 |
| FC | 0.77 | 5.0 | 0.64 | 0.0 | 0.56 | 5.0 |

High reenlistment rates increase the amount of "economic rent" the Navy must pay to induce even higher reenlistment; this makes reenlistment less cost-effective. To illustrate this point, we focus on the Electronics Technician (ET) rating. In FY01, 79 percent of ETs chose to reenlist at a reenlistment bonus level of 5.0. If the Navy were to raise the SRB to 5.5, we predict that an additional 15 Sailors would

39. Reference [1] uses FY99 data as its baseline.

reenlist. The benefits to the Navy from this increase in reenlistment are considerable: $2.3 million in recruiting and training cost savings and in readiness benefits. On the cost side, the Navy would pay about $600,000 in reenlistment bonuses to these new reenlistments. However, the Navy would also have to pay about *$3.3 million* in higher bonuses to individuals who would have reenlisted anyway.[40] These economic rents are larger than the total benefits of the increase in reenlistment and are the result of the extraordinarily high level of reenlistment before the increase in SRB.

## Cost-effective reductions in reenlistment

Inspection of table 13 reveals that lower reenlistment would be cost-effective in most ratings. Only 5 percent of those making zone A reenlistment decisions are in the four ratings for which an increase in reenlistment would be cost-effective. In contrast, 70 percent are in ratings for which we recommend a decrease in reenlistment. The remaining 25 percent are in ratings for which the absence of an SRB precludes us from lowering reenlistment. If reenlistment were lower in these ratings, it would not be cost-effective to raise reenlistment back to its FY01 levels. In other words, lower reenlistment would be cost-effective in these ratings; however, it is not possible to reduce reenlistment rates by cutting SRBs.

Reductions in reenlistment for 95 percent of Sailors is close to a recommendation for an across-the-board reduction in reenlistment rates. However, economic theory tells us that a decrease in the selective reenlistment bonus budget is *not* the most cost-effective way to achieve across-the-board reductions in reenlistment. Rather, a decrease in across-the-board compensation is a more efficient tool to effectively decrease across-the-board reenlistment rates [20].

In contrast, reenlistment bonuses are designed to ensure that billets are fully manned. They are a flexible tool, allowing the Navy to respond quickly and precisely when conditions change on a rating-by-

40. We estimate that this higher reenlistment would generate an additional $300,000 in seniority costs, bringing the total cost of higher reenlistment to about $4.2 million.

rating basis; they are *not* designed to raise or lower across-the-board reenlistment. Our analysis focuses on SRBs because it is a rating-specific analysis, and SRBs are the primary compensation tool that varies by rating. Given our findings that reenlistment rates should be lower in the vast majority of ratings, a focus on across-the-board compensation is appropriate.

With SRBs set at FY01 levels, we estimate that cutting SRBs across the board (where possible) would lower reenlistment rates from 58.4 to 57.5 percent, and would save the Navy about $39 million. Using estimates from [3], we estimate that achieving the same decline in reenlistment through cuts in basic pay would save the Navy about $79 million. Alternatively, DoD could allow basic pay to grow more slowly than any increase in civilian earnings to achieve the same result. In other words, it is more efficient to reduce reenlistment across the board through cuts in basic pay than through cuts in the SRB budget.

A cost-effective compensation system allows the Navy to retain the desired number of Sailors in each rating. Our estimates of the costs and benefits of reenlistment indicate that reenlistment rates should vary by rating. Across-the-board compensation (e.g., basic pay) should be set at the level necessary to achieve the optimal level of reenlistment in ratings with low recruiting and training costs. Targeted compensation (e.g., SRBs) can then be used to augment across-the-board pay for ratings with a higher return on investment of higher reenlistment.

The results in table 13 suggest that the current compensation system is not cost-effective. Current reenlistment levels are so high that targeted compensation is of limited use in achieving steady-state reenlistment goals; in other words, across-the-board compensation is higher than it needs to be to obtain the optimal level of reenlistment in most ratings. We do *not* recommend, then, that the Navy pursue the reenlistment bonus budget implied by column 5 of table 13. Rather, we recommend that the Navy advocate smaller-than-recent increases in basic pay, to realign across-the-board pay with the level necessary to achieve the optimal level of reenlistment.

It is not clear whether the Navy could successfully argue for smaller-than-recent increases in across-the-board compensation. Ultimately,

Congress is responsible for setting basic pay, although it relies on input from all four Services. The 9th QRMC was successful in convincing Congress to aggressively increase basic pay [19], making the argument that military compensation was not comparable with civilian pay. Despite warnings that increases in pay without evidence of a recruiting/retention problem are not cost-effective [12, 21], this military-civilian wage gap was compelling to many. It is uncertain whether it would be politically feasible for the Navy to reverse this position, especially in an environment where military personnel are engaged in operations in Afghanistan and Iraq.

However, there are also political difficulties with dramatic reductions in the SRB budget. If it is more difficult to convince Congress to increase the budget than it is to decrease it, significant cuts today may hamper the Navy's ability to effectively man its billets when the recruiting/retention environment inevitably gets more difficult. Furthermore, our model suggests that this environment can change very quickly. With the recruiting/retention climate resembling FY01 levels, table 13 indicates that it is cost-effective to offer SRBs to about 15 percent of all those making zone A reenlistment decisions. In contrast, if this climate reflected FY99 conditions instead, it would be cost-effective to offer SRBs to roughly two-thirds of these Sailors.[41]

Clearly, our assumptions regarding the recruiting/retention environment are central to our conclusions. Similarly, short-term fluctuations in this climate can mandate greater or lesser reliance on reenlistment bonuses than in the steady state. This reinforces the need to preserve the SRB budget for inevitable improvements in the civilian economy, if it proves difficult to dramatically increase this budget when conditions dictate.

## Implications for current reenlistment levels

Unless we have significantly underestimated the readiness benefits of higher seniority, or unless decreases in reenlistment would create manning shortages, our analysis points to lower, long-term reenlistment levels in all but a few ratings. Rather than immediately cut the

41. These results are available on request.

reenlistment bonus budget to the levels implied by our analysis, however, we recommend that the Navy adopt a *marginal* reduction in reenlistment.

First, the Navy should identify ratings with manning shortages, as well as ratings for which a decrease in reenlistment rates would create such a shortage. Reenlistment should not be decreased in these ratings because it would exacerbate or create a manning problem for the Navy. For ratings with unfilled billets, short-term reenlistment should be *increased,* regardless of the long-run reenlistment goal. However, the long-term goal should be kept in mind. Any increases in reenlistment should be temporary and in response to a manning problem; as conditions permit, the Navy can move toward bringing these ratings closer to their cost-effective level of reenlistment.

If most ratings still have higher than cost-effective reenlistment rates, we recommend that the Navy strongly advocate smaller-than-recent increases in basic pay. Allowing the growth in across-the-board pay to lag behind increases in civilian earnings is a more cost-effective way to decrease across-the-board reenlistment than cutting the SRB budget.

Given the political uncertainty surrounding changes in basic pay, as well as the time delay before any change is implemented, we do recommend a modest cut in the SRB budget. Such a cut for ratings without manning shortages will bring the Navy closer to a cost-effective level of reenlistment. For example, a 0.5 reduction in SRB multipliers in most ratings (with a 0.5 increase in SRBs for the ratings with a positive return on investment of reenlistment) would reduce the SRB budget by about 17 percent. Our estimates imply that Navy-wide reenlistment would fall from 58.4 to 57.6 percent, with a 1.25-percentage-point decline in reenlistment for each rating with a cut in SRBs.[42]

If the decline for a rating is different from what we predict, the costs and benefits of reenlistment for this rating should be recalculated. If further decreases in reenlistment are still warranted, or if the actual

42. The overall retention rate falls by less than 1.25 percentage points because SRBs are increased for some ratings and no SRBs are currently offered in others.

change is similar to what our analysis predicts, the Navy should marginally decrease SRBs in these ratings again. Taking an iterative approach will allow the Navy to monitor reenlistment levels and ensure that declines in reenlistment are not larger than desired.

Like most economic analyses, this approach assumes that all other factors affecting reenlistment are held constant. In reality, all else will *not* remain constant, particularly if the Navy pursues this gradual approach over a number of years. To the extent that changing economic conditions affect the costs and benefits of reenlistment, the Navy's reenlistment goals can differ from those presented here. Consequently, the Navy's reenlistment strategy will depend on changes in the civilian economy. The next section addresses the effect of Sailors' economic opportunities on the costs and benefits to the Navy of reenlistment.

# Economic conditions and the recruiting-retention tradeoff

Economic conditions can change the Navy's reenlistment goals only if the costs and benefits of reenlistment change in different ways. In this section, we examine the impact of the civilian economy on our estimates of reenlistment goals. Our results suggest that these impacts are not necessarily symmetric; the effect of improvements in economic conditions differs in magnitude from the impact of a deterioration in the civilian economy. Therefore, we examine each case separately.

## Increases in reenlistment without changes in SRBs

Our analysis suggests that, if reenlistment is at levels that we conclude are cost-effective, the benefits of additional "free" reenlistment exceed the costs. That is, an increase in reenlistment without an increase in SRBs (and without any other changes in the costs and benefits of reenlistment) is cost-effective. The Navy still has to pay the higher seniority costs associated with this higher reenlistment, as well as any reenlistment bonuses in ratings currently offered SRBs. The value of this additional experience, however, combined with recruiting and training cost savings, overwhelms the cost of "free" reenlistment. Intuitively, this increase in reenlistment is cost-effective because the Navy does not have to pay the "economic rents" associated with an increase in SRBs.

Increases in reenlistment without increases in SRBs can occur because of changing attitudes about the Navy, improvements in working conditions, or deteriorating employment opportunities in the private sector. In addition, manning policies, such as the Navy's "Perform to Serve" initiative, can achieve this "free" increase in reenlistment on a rating-specific basis.[43]

43. Under Perform to Serve, the Navy allows those in overmanned ratings to reenlist, with the caveat that they reenlist into an undermanned rating.

Given the dramatic changes in the economy over the past decade, the Navy is concerned about the relationship between economic conditions and the cost-effective level of reenlistment. A worsening civilian economy is expected to have two effects. First, Sailors making reenlistment decisions are more likely to stay in the Navy. Second, more people will probably wish to join the Navy. If it becomes relatively easy for the Navy to access new recruits, recruiting costs will fall. This lowers the benefits to the Navy of any higher reenlistment. If the decline in recruiting costs is dramatic enough, it is possible that this higher reenlistment is not cost-effective.

## Decreases in reenlistment without changes in SRBs

Similarly, unexpected improvements in the civilian economy are expected to affect the costs and benefits of reenlistment. Reenlistment rates will fall as Sailors leave the Navy to take advantage of civilian earnings opportunities. Furthermore, it becomes more difficult to compete with the private sector for high school graduates, which drives up recruiting costs. The benefits to the Navy of higher reenlistment are twofold. First, any additional reenlistment will generate larger savings in recruiting costs, which increases the value of higher reenlistment. Second, offering reenlistment bonuses to encourage higher retention is more cost-effective in this situation because fewer Sailors would be willing to reenlist without financial incentives.

Changes in reenlistment goals due to changes in the civilian economy, therefore, depend on the magnitude of two relationships: the impact of economic conditions on the propensity to reenlist, and the effect of the civilian economy on the propensity to join the Navy. We discuss estimates of each of these relationships before estimating the effect of economic conditions on the Navy's reenlistment goals.

## Economic conditions and the propensity to reenlist

As we have discussed, a large body of literature examines the relationship between changes in relative compensation and changes in reenlistment. Reference [3] examines many of the estimates of this relationship and concludes that a pay elasticity of 1.5 best describes the effect of changes in pay on reenlistment. In other words, a

1-percent increase in military compensation, holding all else constant, causes a 1.5-percent increase in reenlistment.[44]

According to the Annualized Cost of Leaving model [3] used to estimate this relationship, Sailors treat all compensation equally, regardless of source. A $1,000 increase in military compensation has the same effect on reenlistment as a $1,000 decrease in expected civilian earnings so estimates of the effect of military pay can also be used to predict the effect of civilian pay. We assume that a 1-percent increase in civilian earnings causes a 1.5-percent decrease in reenlisment.

This estimate assumes that all other factors remain constant. The interpretation of a "1-percent increase in civilian earnings," therefore, is that civilian earnings are increasing at a faster rate than military compensation. For example, earnings growth in the private sector can outstrip planned increases in basic pay. We do not assume that military compensation fails to increase in a given year but rather that civilian earnings grow faster than military pay.

Reference [3] concludes that there is little variation over time in the magnitude of this relationship. In other words, the effect of changes in civilian earnings on reenlistment rates does not change as economic conditions change. This is important because our cost-benefit analysis relies on a constant estimate of the effect of compensation.

This literature also considers the effect of changes in the civilian unemployment rate and the propensity to reenlist. Unemployment rate effects are notably smaller than the impact of compensation. For example, reference [3] estimates that a 1-percentage-point increase in the civilian unemployment rate raises zone A reenlistment rates by 1 percentage point. Over the time period on which [3] focuses, this estimate implies that a *17-percent* increase in unemployment raises reenlistment by only 3 percent.[45]

---

44. In this case, reenlistment does *not* include unconditional extensions.

45. It is possible that this estimate is so small because it is measured holding civilian earnings constant. The estimated effect of unemployment is the marginal impact that the likelihood of finding civilian employment has on reenlistment, above and beyond the impact of civilian earnings.

## Economic conditions and recruiting costs

There are few estimates of how changes in enlistment incentives affect the supply of recruits. As [22] discusses, enlistment bonuses are often set based on current or expected recruiting shortfalls, so establishing causality between these incentives and the supply of recruits to a given rating is quite difficult. In fact, reference [22] argues that, without experimental data, it is virtually impossible to separate the effect of classifiers from the influence of enlistment incentives.

A larger body of literature examines the general effect of changes in relative earnings opportunities on the propensity to enlist. One of the most recent studies concludes that a 1-percent increase in civilian earnings causes a 1.2-percent decline in the supply of recruits [23]. Reference [23] also concludes that this relationship has changed little over time.

We estimate the effect of civilian compensation on the supply of recruits by examining NRD-level data on the number of A-cell accessions, the number of recruiters, and civilian employment opportunities from FY92 to FY01. Using this framework, we estimate that a 1-percent increase in expected civilian compensation lowers the number of A-cell enlistments by about 1 percent.[46] Regardless of which elasticity we use, a 1-percent increase in civilian earnings results in a very small change in recruiting costs.

Finally, several studies estimate the effect of changes in unemployment rates on the supply of recruits. Reference [24], for example, estimates that a 1-percentage-point increase in the civilian unemployment rate results in a 2.8-percent increase in the number of A-cell recruits.[47] Our estimates appear considerably larger: our data suggest that a 1-percentage-point decrease in the unemployment rate leads to a *14-percent* decrease in the supply of A-cell recruits. This relationship, however, is highly nonlinear; at higher unemployment rates, the

46. Appendix C contains a discussion of our enlistment model.

47. Reference [25] estimates a much smaller relationship, although the authors estimate the change in the probability that a person chooses to enlist—not the change in the actual number of enlistments.

effect is much smaller and more comparable to the results in [26].[48] At the steady-state level of unemployment, however, we predict that a 1-percentage-point decrease in the unemployment rate would increase recruiting costs by about 10 percent.

## Economic conditions and rating-specific reenlistment goals

Given these estimates of the relationship between economic conditions and the costs and benefits of reenlistment, we consider how changes in civilian employment opportunities affect the Navy's reenlistment goals. Table 15 examines the impact of three separate changes in economic conditions:

- A 1-percent decrease in civilian earnings
- A 1-percent increase in civilian earnings
- A 1-percentage-point decline in unemployment rates.

For each scenario, table 15 displays the change in reenlistment goal for the Navy; in addition, we present data for ratings that have notable changes.

The literature estimates that a 1-percent decline in civilian earnings increases reenlistment rates by 1.5 percent. Furthermore, we have argued that, unless recruiting costs change dramatically, the Navy should take advantage of this higher reenlistment but not change retention any further. As table 15 shows, this is exactly what our model predicts. The Navy's reenlistment goal rises 1.5 percent, from 53.5 to 54.2 percent. In fact, the reenlistment goal for each rating increases by the same percentage. Because this increase in reenlistment occurs without any change in Navy policy, the SRB budget remains unchanged.

48. Unemployment rates were higher during the 1990s. Reference [25] notes that nonlinearities likely exist but does not estimate their effects. In addition, we test and correct for heteroskedasticity; this produces higher estimates than without the correction.

Table 15. Economic conditions and reenlistment goals

| Rating | Original reenlistment goal | Original SRB multiplier | New reenlistment goal | New SRB multiplier |
|---|---|---|---|---|
| 1-percent decrease in civilian earnings | | | | |
| **Navy-wide** | **0.535** | | **0.542** | |
| 1-percent increase in civilian earnings | | | | |
| **Navy-wide** | **0.535** | | **0.528** | |
| AW | 0.42 | 1.5 | 0.43 | 2.0 |
| CTI | 0.58 | 7.5 | 0.59 | 8.5 |
| STG | 0.51 | 0 | 0.51 | 0.5 |
| 1-percentage-point decrease in unemployment rates | | | | |
| **Navy-wide** | **0.535** | | **0.527** | |
| AT | 0.41 | 0.5 | 0.41 | 1.0 |
| AW | 0.42 | 1.5 | 0.43 | 2.0 |
| CTI | 0.58 | 7.5 | 0.59 | 8.5 |
| CTR | 0.47 | 0.5 | 0.47 | 1.0 |
| EM | 0.47 | 1.0 | 0.47 | 1.5 |
| ET (NF) | 0.57 | 2.0 | 0.57 | 2.5 |
| MU | 0.66 | 0.5 | 0.66 | 1.0 |
| AS | 0.50 | 0 | 0.51 | 0.5 |
| GSE | 0.41 | 0 | 0.41 | 0.5 |
| STG | 0.51 | 0 | 0.51 | 0.5 |

With a 1-percent increase in civilian earnings, however, the change in the Navy's reenlistment goal is slightly different. Initially, this change lowers reenlistment rates by 1.5 percent. Left unaltered, the Navy's new reenlistment goal would fall to 52.7 percent. As table 15 shows, however, there are a few ratings (AW, CTI, and STG) for which this decline in reenlistment and increase in recruiting costs leads to a different reenlistment rate. For these ratings, the increase in the benefits of higher reenlistment is enough that the new reenlistment goal is *higher* than before. Furthermore, it is cost-effective for the Navy to raise SRBs in these ratings. Because the number of such ratings is small, the aggregate reenlistment goal of 52.8 percent is only slightly different from the initial effect of the increase in civilian earnings.

This finding is consistent with our conclusion that the cost-effective reenlistment goal for many ratings would be lower than reported in

table 13, *if* the Navy were able to achieve a reduction through decreases in across-the-board compensation. If growth in military compensation lags behind growth in civilian earnings, the effect on the Navy is identical to a decrease in across-the-board pay. Our analysis suggests that it is not cost-effective to raise reenlistment in most ratings after this increase in civilian earnings; in other words, a decrease in across-the-board compensation would be cost-effective.

Finally, a 1-percentage-point decline in the unemployment rate has more visible effects, which should come as no surprise because it is a much larger change in economic conditions. Without any changes in the costs and benefits of reenlistment, this improvement in economic conditions lowers reenlistment from 53.5 to 52.5 percent. The sizable increase in recruiting costs, however, raises the cost-effectiveness of higher reenlistment. Consequently, several ratings see an increase in their SRBs, with some ratings receiving bonuses for the first time. As a result, the Navy's reenlistment goal of 52.7 percent rises from the level implied by the decrease in unemployment.

It is clear that economic conditions affect the Navy's reenlistment goals, but table 15 suggests that these goals do not always change in the way one might expect. First, decreases in reenlistment should *not necessarily* be eradicated with increases in the reenlistment bonus budget. For many ratings, this lower level of reenlistment is more cost-effective than the reenlistment goals we estimate. As the unemployment rate effect suggests, however, there is probably some point for each rating at which it *is* cost-effective to raise SRBs (or to offer bonuses for the first time).

Second, the Navy should *not necessarily* cut the SRB budget during favorable economic conditions. In fact, if SRBs are set correctly, the Navy should take advantage of any "free" reenlistment that it can get. Lowering bonuses would simply erase the benefits of this free reenlistment. If bonuses are not set appropriately, however, decreases are necessary to move the Navy toward a cost-effective level of reenlistment.

# Conclusion

Despite the consensus that higher retention is desirable, our analysis suggests that Navy reenlistment is currently too high. Large military pay raises and a sagging domestic economy have sent reenlistment rates to all-time highs. There have been modest decreases in the selective reenlistment bonus budget; however, these declines have not offset the increases in reenlistment.

Consequently, we conclude that, for most ratings, the costs of reenlistment are higher than the benefits. In other words, it would be cost-effective for the Navy to lower reenlistment levels in all but a few ratings. This does not imply, however, that the Navy should immediately decrease the SRB budget to the levels implied by our results. Rather, it is more efficient to pursue across-the-board reductions in reenlistment with smaller-than-recent increases in basic pay. This approach preserves the greatest flexibility for the Navy and avoids significant reduction in the SRB budget.

If it is not feasible to reduce across-the-board compensation, we recommend that the Navy pursue these reenlistment goals gradually, through periodic reductions in SRB budgets. This will allow Navy leadership to monitor reenlistment and verify that Sailors are responding to changes in compensation in a way consistent with our estimates. If actual behavior is substantively different from predicted behavior, a reevaluation of the Navy's reenlistment goals will be warranted.

Finally, we conclude that economic conditions do influence the desired level of reenlistment but reenlistment goals do not always change the way one might expect. Decreases in reenlistment should not necessarily be eliminated with commensurate increases in SRBs. For many ratings, this lower level of reenlistment is cost-effective. Furthermore, the Navy should not necessarily cut the SRB budget during a favorable economic environment. In fact, if SRBs are set correctly,

the Navy should take advantage of any "free" reenlistment that it can get. Lowering SRBs would simply erase the benefits of this free reenlistment. If bonuses are not set appropriately, however, decreases are necessary to move the Navy toward a cost-effective level of reenlistment.

# Appendix A: Results for all ratings

This appendix lists the results of our analysis for each rating. Table 16 is a list of all ratings that we consider in this analysis. It describes each rating and gives the marginal recruiting cost. Tables 17 through 23 contain the complete set of data that are referenced in the text.

Table 16. Ratings, description, and marginal recruiting costs (dollars)

| Rating | Description | Marginal cost |
|---|---|---|
| ABE | Aviation Boatswain's Mate - Launching and Recovery Equipment | 8,772 |
| ABF | Aviation Boatswain's Mate - Fuels | 8,455 |
| ABH | Aviation Boatswain's Mate - Aircraft Handling | 9,669 |
| AC | Air Traffic Controller | 17,074 |
| AD | Aviation Machinist's Mate | 11,597 |
| AE | Aviation Electrician's Mate | 17,990 |
| AG | Aerographer's Mate | 11,981 |
| AK | Aviation Storekeeper | 14,688 |
| AME | Aviation Structural Mechanic - Safety Equipment | 12,929 |
| AMH | Aviation Structural Mechanic - Hydraulics | 13,261 |
| AMS | Aviation Structural Mechanic - Structures | 13,114 |
| AO | Aviation Ordnanceman | 11,135 |
| AS | Aviation Support Equipment Technician | 12,369 |
| AT | Aviation Electronics Technician | 18,399 |
| AW | Aviation Antisubmarine Warfare Operator | 17,053 |
| AZ | Aviation Maintenance Administrationman | 15,876 |
| BU | Builder | 12,522 |
| CE | Construction Electrician | 12,308 |
| CM | Construction Mechanic | 11,472 |
| CTA | Cryptologic Technician - Administration | 12,642 |
| CTI | Cryptologic Technician - Interpreter/Linguist | 23,097 |
| CTM | Cryptologic Technician - Maintenance | 18,602 |
| CTO | Cryptologic Technician - Communications | 18,244 |
| CTR | Cryptologic Technician - Collection | 19,626 |
| CTT | Cryptologic Technician - Technical | 16,982 |
| DC | Damage Controlman | 12,790 |
| DK | Disbursing Clerk | 16,396 |
| DT | Dental Technician | 11,679 |
| EA | Engineering Aid | 22,198 |
| EM | Electrician's Mate | 13,009 |
| EM (NF) | Electrician's Mate (Nuclear Field) | 25,842 |
| EN | Engineman | 11,495 |
| EO | Equipment Operator | 10,311 |
| ET | Electronics Technician | 21,812 |
| ET (NF) | Electronics Technician (Nuclear Field) | 25,908 |
| EW | Electronics Warfare Technician | 18,371 |

Table 16. Ratings, description, and marginal recruiting costs (dollars) (continued)

| Rating | Description | Marginal cost |
|---|---|---|
| FC | Fire Control Technician | 20,912 |
| FT | Fire Control Technician | 21,869 |
| GM | Gunner's Mate | 15,809 |
| GSE | Gas Turbine Systems Technician - Electrical | 15,097 |
| GSM | Gas Turbine Systems Technician - Mechanical | 13,761 |
| HM | Hospital Corpsman | 15,501 |
| HT | Hull Maintenance Technician | 14,395 |
| IC | Interior Communications Electrician | 16,233 |
| IS | Intelligence Specialist | 19,773 |
| IT | Information Technology | 17,589 |
| JO | Journalist | 20,123 |
| LI | Lithographer | 16,454 |
| MA | Master-at-Arms | 13,096 |
| MM | Machinist's Mate | 13,052 |
| MM (NF) | Machinist's Mate (Nuclear Field) | 25,443 |
| MN | Mineman | 12,898 |
| MR | Machinery Repairman | 17,661 |
| MS | Mess Management Specialist | 10,363 |
| MT | Missile Technician | 21,022 |
| MU | Musician | 20,161 |
| OS | Operations Specialist | 14,741 |
| PC | Postal Clerk | 18,313 |
| PH | Photographer's Mate | 17,920 |
| PN | Personnelman | 16,950 |
| PR | Parachute Rigger / Aircrew Survival Equipmentman | 13,965 |
| QM | Quartermaster | 12,246 |
| RP | Religious Program Specialist | 13,019 |
| SH | Ship's Serviceman | 11,675 |
| SK | Storekeeper | 16,519 |
| SM | Signalman | 9,873 |
| STG | Sonar Technician - Surface | 19,755 |
| STS | Sonar Technician - Submarine | 21,869 |
| SW | Steelworker | 11,484 |
| TM | Torpedoman | 10,998 |
| UT | Utilitiesman | 11,108 |
| YN | Yeoman | 11,968 |

Table 17. Average number of days in training[a]

| Rating | Awaiting instruction | Under instruction | Interrupted instruction | Awaiting transfer | Total |
|---|---|---|---|---|---|
| ABE | 15 | 114 | 3 | 2 | 134 |
| ABF | 14 | 120 | 3 | 1 | 138 |
| ABH | 20 | 119 | 3 | 1 | 143 |
| AC | 22 | 197 | 8 | 6 | 233 |
| AD | 17 | 151 | 5 | 7 | 180 |
| AE | 14 | 260 | 13 | 13 | 299 |
| AG | 21 | 174 | 9 | 2 | 205 |
| AK | 12 | 122 | 2 | 3 | 139 |
| AM | 9 | 153 | 4 | 4 | 170 |
| AME | 17 | 153 | 5 | 3 | 177 |
| AMH | 19 | 159 | 5 | 8 | 190 |
| AMS | 17 | 161 | 6 | 6 | 189 |
| AO | 13 | 141 | 4 | 3 | 162 |
| AS | 26 | 237 | 9 | 6 | 278 |
| AT | 23 | 281 | 10 | 16 | 330 |
| AW | 34 | 324 | 27 | 14 | 399 |
| AZ | 12 | 145 | 2 | 2 | 161 |
| BU | 20 | 171 | 8 | 1 | 200 |
| CE | 22 | 179 | 6 | 2 | 209 |
| CM | 12 | 183 | 5 | 2 | 202 |
| CTA | 25 | 138 | 8 | 12 | 182 |
| CTI | 69 | 629 | 10 | 10 | 718 |
| CTM | 44 | 343 | 10 | 17 | 414 |
| CTO | 37 | 197 | 8 | 17 | 259 |
| CTR | 51 | 292 | 35 | 9 | 386 |
| CTT | 92 | 207 | 6 | 10 | 314 |
| DC | 19 | 162 | 6 | 3 | 190 |
| DK | 24 | 137 | 2 | 1 | 164 |
| DS | 63 | 481 | 10 | 38 | 591 |
| DT | 24 | 174 | 5 | 1 | 203 |
| EA | 14 | 224 | 4 | 1 | 243 |
| EM | 26 | 286 | 11 | 7 | 330 |
| EM (NF) | 44 | 549 | 3 | 2 | 598 |
| EN | 15 | 211 | 10 | 5 | 241 |
| EO | 16 | 179 | 4 | 0 | 199 |
| ET | 40 | 413 | 17 | 21 | 491 |
| ET (NF) | 41 | 602 | 2 | 2 | 646 |
| EW | 26 | 325 | 10 | 5 | 366 |

Table 17. Average number of days in training[a] (continued)

| Rating | Awaiting instruction | Under instruction | Interrupted instruction | Awaiting transfer | Total |
|---|---|---|---|---|---|
| FC | 40 | 492 | 25 | 8 | 564 |
| FT | 21 | 375 | 14 | 6 | 416 |
| GM | 22 | 307 | 15 | 8 | 353 |
| GSE | 29 | 280 | 12 | 13 | 334 |
| GSM | 20 | 200 | 9 | 7 | 236 |
| HM | 16 | 251 | 9 | 2 | 278 |
| HT | 17 | 212 | 8 | 5 | 242 |
| IC | 26 | 283 | 13 | 7 | 329 |
| IS | 12 | 222 | 6 | 7 | 247 |
| IT | 13 | 187 | 9 | 12 | 221 |
| JO | 23 | 243 | 2 | 4 | 271 |
| LI | 7 | 165 | 9 | 1 | 182 |
| MA | 11 | 124 | 2 | 14 | 151 |
| MM | 24 | 251 | 7 | 6 | 288 |
| MM (NF) | 42 | 553 | 3 | 1 | 599 |
| MN | 7 | 233 | 4 | 1 | 244 |
| MR | 24 | 184 | 9 | 3 | 220 |
| MS | 8 | 123 | 2 | 1 | 134 |
| MT | 42 | 394 | 13 | 5 | 455 |
| MU | 17 | 187 | 3 | 5 | 212 |
| OS | 6 | 173 | 7 | 2 | 187 |
| PC | 8 | 92 | 1 | 0 | 100 |
| PH | 22 | 194 | 2 | 2 | 220 |
| PN | 17 | 126 | 2 | 2 | 147 |
| PR | 18 | 133 | 6 | 6 | 163 |
| QM | 13 | 134 | 4 | 4 | 154 |
| RP | 9 | 134 | 1 | 2 | 146 |
| SH | 14 | 120 | 2 | 4 | 141 |
| SK | 12 | 127 | 4 | 3 | 146 |
| SM | 13 | 114 | 3 | 4 | 135 |
| STG | 41 | 338 | 15 | 4 | 398 |
| STS | 25 | 246 | 9 | 3 | 283 |
| SW | 28 | 172 | 4 | 1 | 205 |
| TM | 26 | 184 | 6 | 6 | 223 |
| UT | 16 | 171 | 4 | 1 | 191 |
| YN | 15 | 129 | 5 | 3 | 152 |

a. Sample includes all who receive the rating they were initially promised and do not attrite. Time in boot camp is included in total training time.

Table 18. Average class size[a] and average costs of training

| Rating | Average class size | Average cost of training (dollars) |
|---|---|---|
| ABE | 23.4 | 11,825 |
| ABF | 21.9 | 12,231 |
| ABH | 20.7 | 12,620 |
| AC | 25.8 | 20,569 |
| AD | 18.6 | 16,319 |
| AE | 16.9 | 27,195 |
| AG | 10.1 | 19,722 |
| AK | 10.6 | 13,288 |
| AM | 20.4 | 15,160 |
| AME | 15.3 | 16,152 |
| AMH | 21.5 | 16,817 |
| AMS | 21.6 | 16,857 |
| AO | 20.2 | 14,419 |
| AS | 14.0 | 25,849 |
| AT | 20.6 | 29,695 |
| AW | 12.2 | 37,800 |
| AZ | 7.5 | 16,357 |
| BU | 13.5 | 18,413 |
| CE | 10.0 | 20,277 |
| CM | 9.6 | 19,451 |
| CTA | 5.8 | 18,639 |
| CTI | 3.7 | 87,669 |
| CTM | 8.8 | 41,921 |
| CTO | 7.8 | 25,494 |
| CTR | 7.0 | 38,918 |
| CTT | 7.5 | 30,512 |
| DC | 20.5 | 16,909 |
| DK | 11.6 | 15,509 |
| DS | 28.7 | 54,111 |
| DT | 8.8 | 20,039 |
| EA | 7.6 | 25,364 |
| EM | 31.9 | 29,858 |
| EM (NF) | 41.2 | 57,125 |
| EN | 25.9 | 21,384 |
| EO | 11.4 | 18,618 |
| ET | 41.2 | 44,360 |
| ET (NF) | 28.3 | 62,570 |
| EW | 7.1 | 38,395 |

Table 18. Average class size[a] and average costs of training (continued)

| Rating | Average class size | Average cost of training (dollars) |
|---|---|---|
| FC | 32.3 | 51,215 |
| FT | 12.8 | 40,179 |
| GM | 11.6 | 33,352 |
| GSE | 29.3 | 29,571 |
| GSM | 27.7 | 21,017 |
| HM | 68.8 | 23,993 |
| HT | 23.2 | 21,689 |
| IC | 26.5 | 29,345 |
| IS | 10.1 | 24,241 |
| IT | 24.7 | 19,615 |
| JO | 7.7 | 27,760 |
| LI | 9.3 | 17,581 |
| MA | 14.0 | 13,978 |
| MM | 27.6 | 26,396 |
| MM (NF) | 53.3 | 56,894 |
| MN | 5.6 | 27,132 |
| MR | 30.5 | 19,028 |
| MS | 16.0 | 12,284 |
| MT | 9.6 | 45,616 |
| MU | 3.8 | 25,936 |
| OS | 13.7 | 17,644 |
| PC | 18.0 | 9,043 |
| PH | 8.7 | 21,641 |
| PN | 13.1 | 13,759 |
| PR | 21.6 | 14,502 |
| QM | 10.8 | 14,765 |
| RP | 6.4 | 15,309 |
| SH | 11.7 | 13,236 |
| SK | 13.1 | 13,613 |
| SM | 10.3 | 12,749 |
| STG | 12.4 | 38,593 |
| STS | 15.5 | 26,028 |
| SW | 11.2 | 19,399 |
| TM | 7.2 | 22,273 |
| UT | 8.6 | 18,849 |
| YN | 14.5 | 14,001 |

a. Data are for all classes following boot camp and include all Sailors attending a class.

Table 19. Value of additional experience—1-percentage-point increase in reenlistment

| Rating | Initial years of service | New years of service | Dollar value per man-year |
|---|---|---|---|
| ABE | 6.82 | 6.86 | 1,666.82 |
| ABF | 7.45 | 7.49 | 1,675.38 |
| ABH | 6.76 | 6.80 | 1,653.45 |
| AC | 6.46 | 6.49 | 1,931.18 |
| AD | 6.99 | 7.04 | 1,871.18 |
| AE | 5.64 | 5.68 | 1,896.52 |
| AG | 6.22 | 6.26 | 1,900.78 |
| AK | 6.72 | 6.76 | 1,683.20 |
| AME | 7.23 | 7.27 | 1,877.00 |
| AMH | 6.95 | 6.99 | 1,889.41 |
| AMS | 7.00 | 7.04 | 1,900.95 |
| AO | 6.29 | 6.34 | 1,682.20 |
| AS | 7.20 | 7.25 | 1,883.04 |
| AT | 6.13 | 6.17 | 1,901.37 |
| AW | 6.16 | 6.20 | 1,712.04 |
| AZ | 6.89 | 6.93 | 1,671.88 |
| BU | 6.25 | 6.29 | 1,709.10 |
| CE | 5.79 | 5.83 | 1,920.43 |
| CM | 7.12 | 7.16 | 1,884.72 |
| CTA | 7.28 | 7.32 | 1,706.22 |
| CTI | 6.32 | 6.36 | 1,692.74 |
| CTM | 5.91 | 5.95 | 1,945.74 |
| CTO | 5.62 | 5.66 | 1,941.73 |
| CTR | 6.06 | 6.10 | 1,915.71 |
| CTT | 5.47 | 5.50 | 1,933.05 |
| DC | 6.23 | 6.27 | 1,886.71 |
| DK | 7.42 | 7.46 | 1,669.79 |
| DT | 7.10 | 7.14 | 1,877.20 |
| EA | 6.31 | 6.34 | 1,896.53 |
| EM | 5.97 | 6.01 | 1,885.86 |
| EM (NF) | 4.55 | 4.57 | 2,009.60 |
| EN | 6.85 | 6.90 | 1,859.66 |
| EO | 5.54 | 5.58 | 1,704.78 |
| ET | 6.16 | 6.19 | 1,965.38 |
| ET (NF) | 4.66 | 4.69 | 1,974.88 |
| EW | 6.30 | 6.34 | 1,908.99 |
| FC | 6.35 | 6.39 | 1,915.50 |

Table 19. Value of additional experience—1-percentage-point increase in reenlistment (continued)

| Rating | Initial years of service | New years of service | Dollar value per man-year |
|---|---|---|---|
| FT | 7.66 | 7.70 | 1,869.92 |
| GM | 5.97 | 6.02 | 1,691.03 |
| GSE | 5.55 | 5.59 | 1,929.77 |
| GSM | 5.90 | 5.94 | 1,939.85 |
| HM | 6.78 | 6.82 | 1,876.51 |
| HT | 5.75 | 5.80 | 1,902.38 |
| IC | 4.78 | 4.81 | 1,928.63 |
| IS | 6.64 | 6.69 | 1,667.32 |
| IT | 5.81 | 5.85 | 1,698.54 |
| JO | 6.44 | 6.47 | 1,707.36 |
| LI | 5.76 | 5.80 | 1,705.61 |
| MA | 7.97 | 8.01 | 1,683.72 |
| MM | 5.91 | 5.95 | 1,900.66 |
| MM (NF) | 4.54 | 4.57 | 1,988.66 |
| MN | 6.63 | 6.67 | 1,701.44 |
| MR | 5.79 | 5.83 | 1,702.10 |
| MS | 6.12 | 6.16 | 1,676.82 |
| MT | 7.86 | 7.90 | 1,864.54 |
| MU | 8.78 | 8.81 | 1,620.31 |
| OS | 6.14 | 6.18 | 1,707.85 |
| PC | 7.39 | 7.44 | 1,647.46 |
| PH | 5.30 | 5.34 | 1,711.28 |
| PN | 7.41 | 7.45 | 1,660.55 |
| PR | 7.28 | 7.32 | 1,649.79 |
| QM | 6.37 | 6.42 | 1,680.14 |
| RP | 7.75 | 7.80 | 1,619.13 |
| SH | 6.58 | 6.62 | 1,683.00 |
| SK | 6.91 | 6.96 | 1,670.26 |
| SM | 6.41 | 6.46 | 1,641.12 |
| STG | 6.60 | 6.64 | 1,888.51 |
| STS | 6.33 | 6.36 | 1,925.24 |
| SW | 7.16 | 7.20 | 1,648.36 |
| TM | 5.69 | 5.73 | 1,694.67 |
| UT | 5.69 | 5.73 | 1,920.47 |
| YN | 6.96 | 7.00 | 1,680.97 |

Table 20. Marginal benefits of a 1-percentage-point increase in reenlistment

| Rating | Recruiting | Training | Experience | Total | Total per reenlistment |
|---|---|---|---|---|---|
| ABE | $24,561 | $33,109 | $135,395 | $193,066 | $96,533 |
| ABF | $17,755 | $25,684 | $131,707 | $175,146 | $116,764 |
| ABH | $40,610 | $53,002 | $219,607 | $313,219 | $104,406 |
| AC | $59,760 | $71,990 | $180,116 | $311,867 | $124,747 |
| AD | $105,529 | $148,502 | $547,838 | $801,869 | $123,364 |
| AE | $151,120 | $228,437 | $373,122 | $752,678 | $125,446 |
| AG | $25,160 | $41,417 | $113,216 | $179,793 | $119,862 |
| AK | $71,971 | $65,109 | $247,019 | $384,100 | $109,743 |
| AME | $27,151 | $33,919 | $127,644 | $188,715 | $125,810 |
| AMH | $46,413 | $58,858 | $216,157 | $321,429 | $128,571 |
| AMS | $82,615 | $106,200 | $403,880 | $592,695 | $131,710 |
| AO | $101,328 | $131,210 | $456,079 | $688,616 | $105,941 |
| AS | $43,292 | $90,472 | $187,724 | $321,488 | $128,595 |
| AT | $283,347 | $457,307 | $780,667 | $1,521,321 | $138,302 |
| AW | $59,687 | $132,302 | $141,707 | $333,695 | $133,478 |
| AZ | $66,680 | $68,698 | $218,337 | $353,715 | $117,905 |
| BU | $43,826 | $64,447 | $167,388 | $275,660 | $110,264 |
| CE | $25,847 | $42,582 | $84,254 | $152,682 | $101,788 |
| CM | $24,091 | $40,847 | $128,177 | $193,116 | $128,744 |
| CTA | $17,699 | $26,095 | $66,800 | $110,594 | $110,594 |
| CTI | $48,503 | $184,105 | $83,376 | $315,984 | $210,656 |
| CTM | $52,087 | $117,379 | $109,117 | $278,583 | $139,292 |
| CTO | $51,083 | $71,384 | $125,492 | $247,958 | $123,979 |
| CTR | $96,166 | $190,696 | $216,483 | $503,344 | $143,813 |
| CTT | $35,661 | $64,075 | $62,908 | $162,644 | $108,430 |
| DC | $71,625 | $94,691 | $291,192 | $457,508 | $114,377 |
| DK | $34,432 | $32,569 | $111,898 | $178,899 | $119,266 |
| DT | $49,053 | $84,165 | $228,652 | $361,870 | $120,623 |
| EA | $15,539 | $17,755 | $18,386 | $51,680 | $103,360 |
| EM | $100,172 | $229,910 | $384,475 | $714,556 | $129,919 |
| EM (NF) | $162,805 | $359,885 | $219,639 | $742,329 | $164,962 |
| EN | $88,510 | $164,660 | $485,974 | $739,144 | $134,390 |
| EO | $21,653 | $39,099 | $94,175 | $154,926 | $103,284 |
| ET | $366,439 | $745,240 | $905,733 | $2,017,412 | $168,118 |
| ET (NF) | $126,951 | $306,592 | $170,282 | $603,825 | $172,521 |
| EW | $51,440 | $107,506 | $128,273 | $287,219 | $143,610 |
| FC | $219,576 | $537,756 | $595,764 | $1,353,095 | $180,413 |
| FT | $30,617 | $56,250 | $83,808 | $170,675 | $170,675 |

Table 20. Marginal benefits of a 1-percentage-point increase in reenlistment (continued)

| Rating | Recruiting | Training | Experience | Total | Total per reenlistment |
|---|---|---|---|---|---|
| GM | $110,660 | $233,461 | $309,312 | $653,433 | $130,687 |
| GSE | $42,271 | $82,798 | $112,282 | $237,351 | $118,675 |
| GSM | $67,428 | $102,984 | $226,863 | $397,275 | $113,507 |
| HM | $444,893 | $688,613 | $1,668,627 | $2,802,133 | $136,689 |
| HT | $80,614 | $121,459 | $274,426 | $476,499 | $119,125 |
| IC | $79,542 | $143,792 | $183,151 | $406,486 | $116,139 |
| IS | $69,204 | $84,843 | $154,019 | $308,066 | $123,226 |
| IT | $332,427 | $370,731 | $834,132 | $1,537,290 | $113,873 |
| JO | $15,698 | $21,656 | $37,041 | $74,396 | $133,508 |
| LI | $11,518 | $12,307 | $13,813 | $37,638 | $75,276 |
| MA | $27,501 | $29,353 | $88,651 | $145,506 | $97,004 |
| MM | $219,279 | $443,455 | $898,447 | $1,561,180 | $130,098 |
| MM (NF) | $284,964 | $637,214 | $402,616 | $1,324,795 | $165,599 |
| MN | $18,057 | $37,985 | $45,127 | $101,168 | $101,168 |
| MR | $37,088 | $39,958 | $68,993 | $146,039 | $97,360 |
| MS | $137,821 | $163,382 | $631,813 | $933,017 | $98,212 |
| MT | $29,431 | $63,863 | $97,633 | $190,928 | $190,928 |
| MU | $14,113 | $18,155 | $33,723 | $65,990 | $131,980 |
| OS | $185,743 | $222,318 | $609,008 | $1,017,069 | $113,008 |
| PC | $25,638 | $12,660 | $74,383 | $112,681 | $112,681 |
| PH | $27,597 | $33,327 | $57,733 | $118,658 | $107,871 |
| PN | $71,188 | $57,787 | $238,520 | $367,496 | $122,499 |
| PR | $29,327 | $30,454 | $106,321 | $166,102 | $110,735 |
| QM | $42,860 | $51,677 | $169,360 | $263,897 | $105,559 |
| RP | $12,759 | $15,002 | $59,903 | $87,664 | $125,235 |
| SH | $49,033 | $55,589 | $183,840 | $288,462 | $96,154 |
| SK | $127,199 | $104,822 | $423,002 | $655,023 | $119,095 |
| SM | $27,645 | $35,696 | $131,169 | $194,510 | $97,255 |
| STG | $110,627 | $216,122 | $318,348 | $645,097 | $161,274 |
| STS | $76,542 | $91,098 | $136,894 | $304,534 | $121,813 |
| SW | $16,078 | $27,158 | $53,825 | $97,061 | $97,061 |
| TM | $23,096 | $46,773 | $80,612 | $150,481 | $100,321 |
| UT | $15,551 | $26,388 | $60,369 | $102,309 | $102,309 |
| YN | $108,912 | $127,410 | $497,961 | $734,283 | $112,967 |

Table 21. Marginal cost of reenlistment incentives—1-percentage-point increase in retention

| Rating | Reenlistment rate | SRB multiplier | Expenditures | Cost per reenlistment |
|---|---|---|---|---|
| ABE | 0.52 | 2.5 | $279,207 | $139,604 |
| ABF | 0.56 | 2.5 | $257,264 | $171,509 |
| ABH | 0.35 | 0 | $286,355 | $95,452 |
| AC | 0.72 | 2.5 | $512,702 | $205,081 |
| AD | 0.60 | 1 | $1,109,382 | $170,674 |
| AE | 0.52 | 2 | $915,844 | $152,641 |
| AG | 0.41 | 0.5 | $179,739 | $119,826 |
| AK | 0.49 | 0 | $448,424 | $128,121 |
| AME | 0.63 | 3.5 | $267,867 | $178,578 |
| AMH | 0.61 | 3 | $462,891 | $185,156 |
| AMS | 0.59 | 3 | $852,371 | $189,416 |
| AO | 0.52 | 3 | $1,088,877 | $167,519 |
| AS | 0.41 | 0 | $248,797 | $99,519 |
| AT | 0.48 | 3.5 | $1,704,158 | $154,923 |
| AW | 0.43 | 2.5 | $302,721 | $121,088 |
| AZ | 0.39 | 0 | $317,408 | $105,803 |
| BU | 0.60 | 1 | $399,989 | $159,996 |
| CE | 0.63 | 0.5 | $216,691 | $144,461 |
| CM | 0.55 | 1 | $200,288 | $133,526 |
| CTA | 0.55 | 0.5 | $134,367 | $134,367 |
| CTI | 0.51 | 5.5 | $243,738 | $162,492 |
| CTM | 0.70 | 1.5 | $331,882 | $165,941 |
| CTO | 0.60 | 4 | $379,497 | $189,749 |
| CTR | 0.57 | 4.5 | $606,618 | $173,319 |
| CTT | 0.47 | 3.5 | $219,925 | $146,617 |
| DC | 0.42 | 0.5 | $451,192 | $112,798 |
| DK | 0.65 | 0.5 | $228,829 | $152,553 |
| DT | 0.37 | 0 | $281,593 | $93,864 |
| EA | 0.73 | 2 | $63,249 | $126,499 |
| EM | 0.33 | 0 | $516,668 | $93,940 |
| EM (NF) | 0.78 | 6.5 | $1,106,029 | $245,784 |
| EN | 0.49 | 1 | $813,553 | $147,919 |
| EO | 0.47 | 1 | $187,132 | $124,755 |
| ET | 0.78 | 5 | $3,083,104 | $256,925 |
| ET (NF) | 0.70 | 7.5 | $793,874 | $226,821 |
| EW | 0.58 | 3 | $304,673 | $152,336 |
| FC | 0.76 | 5 | $1,893,861 | $252,515 |

Table 21. Marginal cost of reenlistment incentives—1-percentage-point increase in retention (continued)

| Rating | Reenlistment rate | SRB multiplier | Expenditures | Cost per reenlistment |
|---|---|---|---|---|
| FT | 0.83 | 5 | $230,857 | $230,857 |
| GM | 0.38 | 0 | $530,109 | $106,022 |
| GSE | 0.44 | 1.5 | $242,121 | $121,060 |
| GSM | 0.51 | 1.5 | $482,577 | $137,879 |
| HM | 0.44 | 0 | $2,603,672 | $127,008 |
| HT | 0.46 | 1 | $544,065 | $136,016 |
| IC | 0.41 | 1 | $431,262 | $123,218 |
| IS | 0.48 | 3 | $344,879 | $137,952 |
| IT | 0.44 | 3 | $1,995,039 | $147,781 |
| JO | 0.40 | 0 | $64,335 | $115,454 |
| LI | 0.50 | 0 | $37,216 | $74,432 |
| MA | 0.75 | 1.5 | $259,912 | $173,275 |
| MM | 0.51 | 2 | $1,890,250 | $157,521 |
| MM (NF) | 0.77 | 6 | $2,052,584 | $256,573 |
| MN | 0.65 | 3.5 | $123,687 | $123,687 |
| MR | 0.46 | 0 | $160,217 | $106,812 |
| MS | 0.49 | 0 | $1,286,481 | $135,419 |
| MT | 0.88 | 4.5 | $263,733 | $263,733 |
| MU | 0.27 | 0 | $37,163 | $74,325 |
| OS | 0.55 | 2 | $1,473,235 | $163,693 |
| PC | 0.54 | 1 | $136,839 | $136,839 |
| PH | 0.37 | 0 | $115,114 | $104,649 |
| PN | 0.46 | 0 | $369,997 | $123,332 |
| PR | 0.69 | 2 | $259,956 | $173,304 |
| QM | 0.55 | 2 | $368,325 | $147,330 |
| RP | 0.34 | 0 | $64,209 | $91,727 |
| SH | 0.48 | 1 | $373,793 | $124,598 |
| SK | 0.57 | 0 | $831,994 | $151,272 |
| SM | 0.56 | 2 | $311,512 | $155,756 |
| STG | 0.57 | 3 | $677,813 | $169,453 |
| STS | 0.60 | 6.5 | $475,389 | $190,155 |
| SW | 0.61 | 1.5 | $106,250 | $106,250 |
| TM | 0.37 | 0 | $144,771 | $96,514 |
| UT | 0.54 | 1 | $134,676 | $134,676 |
| YN | 0.51 | 0 | $912,407 | $140,370 |

Table 22. Increase in seniority costs—1-percentage-point increase in reenlistment (dollars)

| Rating | Initial years of service | New years of service | Cost per man-year |
|---|---|---|---|
| ABE | 6.82 | 6.86 | 721.67 |
| ABF | 7.45 | 7.49 | 800.08 |
| ABH | 6.76 | 6.80 | 713.89 |
| AC | 6.46 | 6.49 | 835.38 |
| AD | 6.99 | 7.04 | 767.29 |
| AE | 5.64 | 5.68 | 661.30 |
| AG | 6.22 | 6.26 | 708.90 |
| AK | 6.72 | 6.76 | 753.07 |
| AME | 7.23 | 7.27 | 769.60 |
| AMH | 6.95 | 6.99 | 769.85 |
| AMS | 7.00 | 7.04 | 779.79 |
| AO | 6.29 | 6.34 | 693.39 |
| AS | 7.20 | 7.25 | 795.65 |
| AT | 6.13 | 6.17 | 695.38 |
| AW | 6.16 | 6.20 | 752.59 |
| AZ | 6.89 | 6.93 | 755.62 |
| BU | 6.25 | 6.29 | 731.43 |
| CE | 5.79 | 5.83 | 736.72 |
| CM | 7.12 | 7.16 | 789.02 |
| CTA | 7.28 | 7.32 | 898.10 |
| CTI | 6.32 | 6.36 | 774.76 |
| CTM | 5.91 | 5.95 | 795.28 |
| CTO | 5.62 | 5.66 | 721.15 |
| CTR | 6.06 | 6.10 | 735.64 |
| CTT | 5.47 | 5.50 | 886.70 |
| DC | 6.23 | 6.27 | 675.66 |
| DK | 7.42 | 7.46 | 817.86 |
| DT | 7.10 | 7.14 | 852.28 |
| EA | 6.31 | 6.34 | 882.92 |
| EM | 5.97 | 6.01 | 675.40 |
| EM (NF) | 4.55 | 4.57 | 746.43 |
| EN | 6.85 | 6.90 | 712.19 |
| EO | 5.54 | 5.58 | 650.88 |
| ET | 6.16 | 6.19 | 830.05 |
| ET (NF) | 4.66 | 4.69 | 725.85 |
| EW | 6.30 | 6.34 | 735.20 |
| FC | 6.35 | 6.39 | 798.08 |

Table 22. Increase in seniority costs—1-percentage-point increase in reenlistment (dollars) (continued)

| Rating | Initial years of service | New years of service | Cost per man-year |
|---|---|---|---|
| FT | 7.66 | 7.70 | 928.00 |
| GM | 5.97 | 6.02 | 664.92 |
| GSE | 5.55 | 5.59 | 676.00 |
| GSM | 5.90 | 5.94 | 707.43 |
| HM | 6.78 | 6.82 | 788.44 |
| HT | 5.75 | 5.80 | 661.87 |
| IC | 4.78 | 4.81 | 645.01 |
| IS | 6.64 | 6.69 | 726.60 |
| IT | 5.81 | 5.85 | 671.06 |
| JO | 6.44 | 6.47 | 805.53 |
| LI | 5.76 | 5.80 | 751.05 |
| MA | 7.97 | 8.01 | 1,142.16 |
| MM | 5.91 | 5.95 | 673.09 |
| MM (NF) | 4.54 | 4.57 | 737.05 |
| MN | 6.63 | 6.67 | 753.87 |
| MR | 5.79 | 5.83 | 668.26 |
| MS | 6.12 | 6.16 | 688.33 |
| MT | 7.86 | 7.90 | 928.49 |
| MU | 8.78 | 8.81 | 1,336.02 |
| OS | 6.14 | 6.18 | 698.13 |
| PC | 7.39 | 7.44 | 790.22 |
| PH | 5.30 | 5.34 | 687.74 |
| PN | 7.41 | 7.45 | 825.02 |
| PR | 7.28 | 7.32 | 783.64 |
| QM | 6.37 | 6.42 | 686.57 |
| RP | 7.75 | 7.80 | 821.86 |
| SH | 6.58 | 6.62 | 726.47 |
| SK | 6.91 | 6.96 | 761.80 |
| SM | 6.41 | 6.46 | 677.79 |
| STG | 6.60 | 6.64 | 732.45 |
| STS | 6.33 | 6.36 | 980.04 |
| SW | 7.16 | 7.20 | 760.33 |
| TM | 5.69 | 5.73 | 649.25 |
| UT | 5.69 | 5.73 | 710.28 |
| YN | 6.96 | 7.00 | 786.21 |

Table 23. Marginal costs of a 1-percentage-point increase in reenlistment

| Rating | Reenlistment expenditures | Seniority costs | Total | Total per reenlistment |
|---|---|---|---|---|
| ABE | $279,207 | $58,621 | $337,828 | $168,914 |
| ABF | $257,264 | $62,897 | $320,161 | $213,441 |
| ABH | $286,355 | $94,816 | $381,172 | $127,057 |
| AC | $512,702 | $77,914 | $590,616 | $236,246 |
| AD | $1,109,382 | $224,645 | $1,334,027 | $205,235 |
| AE | $915,844 | $130,104 | $1,045,949 | $174,325 |
| AG | $179,739 | $42,224 | $221,963 | $147,976 |
| AK | $448,424 | $110,517 | $558,942 | $159,698 |
| AME | $267,867 | $52,336 | $320,203 | $213,469 |
| AMH | $462,891 | $88,074 | $550,965 | $220,386 |
| AMS | $852,371 | $165,675 | $1,018,046 | $226,233 |
| AO | $1,088,877 | $187,992 | $1,276,869 | $196,441 |
| AS | $248,797 | $79,320 | $328,117 | $131,247 |
| AT | $1,704,158 | $285,509 | $1,989,667 | $180,879 |
| AW | $302,721 | $62,292 | $365,013 | $146,005 |
| AZ | $317,408 | $98,678 | $416,086 | $138,695 |
| BU | $399,989 | $71,636 | $471,625 | $188,650 |
| CE | $216,691 | $32,321 | $249,013 | $166,008 |
| CM | $200,288 | $53,660 | $253,949 | $169,299 |
| CTA | $134,367 | $35,161 | $169,528 | $169,528 |
| CTI | $243,738 | $38,161 | $281,898 | $187,932 |
| CTM | $331,882 | $44,599 | $376,482 | $188,241 |
| CTO | $379,497 | $46,607 | $426,104 | $213,052 |
| CTR | $606,618 | $83,130 | $689,747 | $197,071 |
| CTT | $219,925 | $28,857 | $248,782 | $165,854 |
| DC | $451,192 | $104,280 | $555,472 | $138,868 |
| DK | $228,829 | $54,807 | $283,636 | $189,091 |
| DT | $281,593 | $103,812 | $385,405 | $128,468 |
| EA | $63,249 | $8,560 | $71,809 | $143,618 |
| EM | $516,668 | $137,696 | $654,364 | $118,975 |
| EM (NF) | $1,106,029 | $81,581 | $1,187,610 | $263,913 |
| EN | $813,553 | $186,113 | $999,666 | $181,757 |
| EO | $187,132 | $35,956 | $223,088 | $148,725 |
| ET | $3,083,104 | $382,525 | $3,465,629 | $288,802 |
| ET (NF) | $793,874 | $62,586 | $856,459 | $244,703 |
| EW | $304,673 | $49,401 | $354,074 | $177,037 |
| FC | $1,893,861 | $248,220 | $2,142,081 | $285,611 |

Table 23. Marginal costs of a 1-percentage-point increase in reenlistment (continued)

| Rating | Reenlistment expenditures | Seniority costs | Total | Total per reenlistment |
|---|---|---|---|---|
| FT | $230,857 | $41,592 | $272,449 | $272,449 |
| GM | $530,109 | $121,623 | $651,732 | $130,346 |
| GSE | $242,121 | $39,332 | $281,453 | $140,727 |
| GSM | $482,577 | $82,733 | $565,311 | $161,517 |
| HM | $2,603,672 | $701,099 | $3,304,771 | $161,208 |
| HT | $544,065 | $95,477 | $639,542 | $159,886 |
| IC | $431,262 | $61,254 | $492,515 | $140,719 |
| IS | $344,879 | $67,120 | $411,999 | $164,800 |
| IT | $1,995,039 | $329,548 | $2,324,586 | $172,192 |
| JO | $64,335 | $17,476 | $81,811 | $146,815 |
| LI | $37,216 | $6,082 | $43,299 | $86,597 |
| MA | $259,912 | $60,137 | $320,049 | $213,366 |
| MM | $1,890,250 | $318,170 | $2,208,419 | $184,035 |
| MM (NF) | $2,052,584 | $149,220 | $2,201,804 | $275,225 |
| MN | $123,687 | $19,994 | $143,682 | $143,682 |
| MR | $160,217 | $27,087 | $187,305 | $124,870 |
| MS | $1,286,481 | $259,358 | $1,545,839 | $162,720 |
| MT | $263,733 | $48,619 | $312,351 | $312,351 |
| MU | $37,163 | $27,806 | $64,969 | $129,937 |
| OS | $1,473,235 | $248,947 | $1,722,182 | $191,354 |
| PC | $136,839 | $35,679 | $172,518 | $172,518 |
| PH | $115,114 | $23,202 | $138,316 | $125,741 |
| PN | $369,997 | $118,505 | $488,502 | $162,834 |
| PR | $259,956 | $50,502 | $310,457 | $206,972 |
| QM | $368,325 | $69,207 | $437,532 | $175,013 |
| RP | $64,209 | $30,406 | $94,616 | $135,165 |
| SH | $373,793 | $79,354 | $453,147 | $151,049 |
| SK | $831,994 | $192,930 | $1,024,924 | $186,350 |
| SM | $311,512 | $54,174 | $365,686 | $182,843 |
| STG | $677,813 | $123,470 | $801,283 | $200,321 |
| STS | $475,389 | $69,685 | $545,074 | $218,030 |
| SW | $106,250 | $24,828 | $131,078 | $131,078 |
| TM | $144,771 | $30,884 | $175,655 | $117,103 |
| UT | $134,676 | $22,327 | $157,004 | $157,004 |
| YN | $912,407 | $232,903 | $1,145,310 | $176,202 |

# Appendix B: Reenlistment goals using occupation-specific effects of compensation

Table 24 lists alternative estimates of reenlistment goals by rating, using the occupation-specific effects of compensation given in [3]. We view the estimates in table 13 as preferable, even though they rely on a single estimate of the effect of SRBs on reenlistment behavior (our "baseline model"). For occupation groups with estimates of the SRB effect that are substantively different from this single estimate, the baseline model is better at predicting reenlistment behavior. For groups with similar estimates of the SRB effect, the occupation-specific models provide more reliable estimates of reenlistment behavior. For these groups, however, the SRB estimates are similar to the baseline model. Given the general "goodness of fit" of the baseline model documented in [3], we prefer the table 13 estimates.

As table 24 shows, however, alternative estimates of the effect of SRBs on reenlistment do generate very different reenlistment goals. Using these different estimates, the Navy-wide reenlistment goal ranges from 56.6 to 57.4 percent, in contrast to a goal of 53.5 percent when using a single estimate.[49] In general, ratings with lower than average elasticities (e.g., CTI) now have lower reenlistment goals than before.

For some ratings with higher elasticities than the average (e.g., HT), however, our cost-benefit analysis now predicts that reenlistment should be *higher.* For other ratings with higher elasticities (e.g., IT), we still predict that reenlistment should decline. Given the larger responsiveness to pay, however, this decline in reenlistment is not as large as before.

---

49. The range of estimates is due to assumptions about whether Sailors extending their current enlistment contracts choose to formally reenlist in response to higher bonuses. If they choose to reenlist, the costs of reenlistment are higher and the retention goal is lower.

Table 24. Rating-specific reenlistment goals

| Rating | FY01 reenlistment rate | FY01 SRB multiplier | SRB effect on reenlistment | New reenlistment rate | New SRB multiplier |
|---|---|---|---|---|---|
| **Navy-wide** | **0.584** | | | **0.566 -- 0.574** | |
| ABE | 0.53 | 2.5 | 0.6 | 0.52 | 0 |
| ABF | 0.56 | 2.5 | 0.6 | 0.55 | 0 |
| ABH | 0.45 | 0 | 0.6 | 0.45 | 0 |
| AC | 0.72 | 2.5 | 1.3 | 0.69 | 0 |
| AD | 0.62 | 1 | 1.3 | 0.61 | 0 |
| AE | 0.52 | 2 | 1.3 | 0.50 | 0 |
| AG | 0.48 | 0.5 | 0.6 | 0.47 | 0 |
| AK | 0.60 | 0 | 4.8 | 0.60 -- 0.64 | 0 -- 1.0 |
| AME | 0.63 | 3.5 | 1.3 | 0.59 | 0 |
| AMH | 0.61 | 3 | 1.3 | 0.57 | 0 |
| AMS | 0.60 | 3 | 1.3 | 0.56 | 0 |
| AO | 0.53 | 3 | 1.3 | 0.49 | 0 |
| AS | 0.50 | 0 | 0.6 | 0.50 | 0 |
| AT | 0.48 | 3.5 | 1.3 | 0.43 | 0 |
| AW | 0.45 | 2.5 | 0.6 | 0.43 | 0 |
| AZ | 0.56 | 0 | 0.6 | 0.56 | 0 |
| BU | 0.61 | 1 | 0 | 0.61 | 0 |
| CE | 0.64 | 0.5 | 0 | 0.64 | 0 |
| CM | 0.57 | 1 | 0 | 0.57 | 0 |
| CTA | 0.69 | 0.5 | 0.6 | 0.68 | 0 |
| CTI | 0.53 | 5.5 | 0.6 | 0.49 | 0 |
| CTM | 0.74 | 1.5 | 0.6 | 0.73 | 0 |
| CTO | 0.61 | 4 | 0.6 | 0.58 | 0 |
| CTR | 0.57 | 4.5 | 0.6 | 0.54 | 0 |
| CTT | 0.48 | 3.5 | 0.6 | 0.46 | 0 |
| DC | 0.47 | 0.5 | 6.1 | 0.62 | 3.0 |
| DK | 0.68 | 0.5 | 4.8 | 0.68 -- 0.70 | 0.5 -- 1.0 |
| DT | 0.72 | 0 | 3.7 | 0.72 -- 0.80 | 0 -- 2.0 |
| EA | 0.73 | 2 | 0 | 0.73 | 0 |
| EM | 0.44 | 0 | 4.2 | 0.55 | 2.5 |
| EM (NF) | 0.78 | 6.5 | 4.2 | 0.74 | 5.5 |
| EN | 0.52 | 1 | 4.2 | 0.54 -- 0.56 | 1.5 -- 2.0 |
| EO | 0.49 | 1 | 0 | 0.49 | 0 |
| ET | 0.79 | 5 | 2.8 | 0.65 | 0 |
| ET (NF) | 0.70 | 7.5 | 2.8 | 0.59 | 3.5 |
| EW | 0.58 | 3 | 3.1 | 0.57 | 2.5 |

Table 24. Rating-specific reenlistment goals (continued)

| Rating | FY01 reenlistment rate | FY01 SRB multiplier | SRB effect on reenlistment | New reenlistment rate | New SRB multiplier |
|---|---|---|---|---|---|
| FC | 0.77 | 5 | 2.8 | 0.63 | 0 |
| FT | 0.83 | 5 | 0.7 | 0.79 | 0 |
| GM | 0.43 | 0 | 0.7 | 0.43 | 0 |
| GSE | 0.45 | 1.5 | 4.2 | 0.53 | 3.5 |
| GSM | 0.51 | 1.5 | 4.2 | 0.53 | 2.0 |
| HM | 0.58 | 0 | 3.7 | 0.58 -- 0.64 | 0 -- 1.5 |
| HT | 0.50 | 1 | 6.1 | 0.65 | 3.5 |
| IC | 0.42 | 1 | 4.2 | 0.49 -- 0.51 | 2.5 -- 3.0 |
| IS | 0.49 | 3 | 0.6 | 0.47 | 0 |
| IT | 0.45 | 3 | 3.2 | 0.39 | 1.0 |
| JO | 0.63 | 0 | 2.1 | 0.63 | 0 |
| LI | 0.60 | 0 | 2.1 | 0.60 | 0 |
| MA | 0.83 | 1.5 | 4.1 | 0.77 | 0 |
| MM | 0.52 | 2 | 4.2 | 0.54 | 2.5 |
| MM_N | 0.78 | 6 | 4.2 | 0.71 | 4.5 |
| MN | 0.65 | 3.5 | 0.7 | 0.63 | 0 |
| MR | 0.48 | 0 | 6.1 | 0.63 | 2.5 |
| MS | 0.58 | 0 | 4.8 | 0.58 | 0 |
| MT | 0.88 | 4.5 | 0.7 | 0.84 | 0 |
| MU | 0.64 | 0 | 0 | 0.64 | 0 |
| OS | 0.55 | 2 | 4.5 | 0.53 | 1.5 |
| PC | 0.56 | 1 | 4.1 | 0.54 | 0.5 |
| PH | 0.51 | 0 | 2.1 | 0.51 | 0 |
| PN | 0.72 | 0 | 4.1 | 0.72 -- 0.74 | 0 -- 0.5 |
| PR | 0.70 | 2 | 0.6 | 0.69 | 0 |
| QM | 0.56 | 2 | 4.5 | 0.54 | 1.5 |
| RP | 0.64 | 0 | 4.1 | 0.64 -- 0.72 | 0 -- 2.0 |
| SH | 0.52 | 1 | 4.8 | 0.52 -- 0.55 | 1.0 -- 1.5 |
| SK | 0.65 | 0 | 4.8 | 0.65 -- 0.68 | 0 -- 0.5 |
| SM | 0.58 | 2 | 4.5 | 0.51 | 0.5 |
| STG | 0.58 | 3 | 3.1 | 0.57 | 2.5 |
| STS | 0.60 | 6.5 | 0.7 | 0.55 | 0 |
| SW | 0.61 | 1.5 | 0 | 0.61 | 0 |
| TM | 0.43 | 0 | 0.7 | 0.43 | 0 |
| UT | 0.56 | 1 | 0 | 0.56 | 0 |
| YN | 0.70 | 0 | 4.1 | 0.70 | 0 |

# Appendix C: Regression results

## Enlistment model

Our model of enlistment behavior examines the relationship between the number of A-cell recruits per Navy recruiting district (NRD) per quarter and several variables of interest. We use quarterly data from FY92 through FY01.[50] Table 25 lists the coefficients and standard errors for each variable in our enlistment model, estimated using feasible generalized least squares. Our technique also includes corrections for heteroskedasticity and autocorrelation.[51]

Our independent variables include the civilian unemployment rate, the square of the unemployment rate, the discounted difference in military and civilian pay (calculated over a 4-year time horizon), the number of (production) recruiters in the region, and the geographical region of the country.[52] Our model also corrects for NRD and fiscal quarter. The last column, the probability that the sample coefficient is equal to zero, is used to determine the statistical significance of each estimate. For example, a probability less than 0.01 means that zero lies outside the 99-percent confidence interval for this estimate.

---

50. We are grateful to Don Bohn and Rudolph Sladyk at CNRC for providing the data.

51. Heteroskedasticity occurs when the errors vary systematically with the size of the unit of observation. In our case, we are estimating the number of A-cell recruits (per 1,000 male high school seniors) in each NRD in each quarter of the year. This number (and the error) is likely to vary more in larger recruiting districts. Autocorrelation occurs when today's error is related to the error from the last quarter, as is often true when we collect data over time.

52. Both the number of A-cell recruits and the number of production recruiters are normed by the number of male high school seniors in the region, measured in thousands. "North" is the excluded region.

Table 25. Regression results—A-cell recruits

| Independent variable | Coefficient | Standard error | Probability coefficient equals zero |
|---|---|---|---|
| Unemployment rate | 0.9628016 | 0.0540939 | 0.000 |
| Unemployment rate squared | -0.0438696 | 0.0044042 | 0.000 |
| Pay difference | 0.00088 | 0.0000152 | 0.000 |
| Production recruiters | 1.654326 | 0.0371112 | 0.000 |
| South region | -0.3899417 | 0.0493765 | 0.000 |
| Central region | 0.3944931 | 0.048634 | 0.000 |
| West region | 0.0883294 | 0.0715955 | 0.217 |

We can use these results to estimate how the quantity of A-cell recruits varies as economic conditions change. For example, to calculate the effect of a 1-percentage-point decrease in the unemployment rate, we lower the unemployment rate and then predict the number of A-cell accessions. This prediction allows us to estimate the effect of a change in the unemployment rate, holding all other factors constant. Similarly, we can estimate the number of additional recruiters necessary to return the Navy to its original number of accessions.

## Training costs

In our training costs model, we estimate how training costs change with the number of recruits. In this specification, our dependent variable is the number of days the recruit spends awaiting instruction. We estimate this outcome as a function of gender, cell (recruit quality), total days under instruction, and the ratio of recruits to seats in the class. We allow the effect of the recruits-to-seats ratio to vary, depending on whether the class is full.[53] We use data from FY97 through FY99 to allow recruits to complete the entire training pipeline.

Table 26 lists our regression results. We use these results to predict how the number of days awaiting instruction will change as the recruits-to-seats ratio changes. As expected, in cases when the class is

53. We also correct for fiscal year, quarter, the interaction between the two, and rating group.

full, adding another recruit increases time awaiting instruction; the opposite is true for classes that are not full. The results, though, are quite small in magnitude. For this reason, we use average training costs in our analysis.

Table 26. Regression results—days awaiting instruction

| Independent variable | Coefficient | Standard error | Probability coefficient equals zero |
|---|---|---|---|
| Male | -0.3512773 | 0.0721912 | 0.000 |
| B-cell | 0.0552416 | 0.0983266 | 0.574 |
| C-cell | 0.2788469 | 0.0595949 | 0.000 |
| D-cell | -0.0303502 | 0.2374458 | 0.898 |
| Nuke | -1.4909419 | 0.0996167 | 0.000 |
| Days under instruction | 0.0905075 | 0.0004592 | 0.000 |
| Recruits-to-seats (full class) | 0.7698878 | 0.0297633 | 0.000 |
| Recruits-to-seats (class not full) | -1.908305 | 0.0915127 | 0.000 |
| Constant | 4.022322 | 0.1834551 | 0.000 |

## Returns to experience

Finally, we calculate returns to experience using data on civilian workers. The dataset we use, the Current Population Survey (CPS), includes information on people in about 60,000 households in the United States. From this sample, we select those men who work full-time throughout the year and are neither high school dropouts nor holders of postgraduate degrees.[54] We use data from 1990 to 2000

54. We exclude women from our sample because their age-experience profiles tend to differ from those of men, based on the higher likelihood that women exit and reenter the labor force. We are interested in the potential gain from experience over time; the CPS does not include any information about past work history or true years of experience, so we use only men and assume that they have constantly remained in the labor force. These estimates, then, represent the gains over time to experience and should be applicable to all Sailors, regardless of gender.

and separate civilian occupations into technical and nontechnical groups. Separate estimates of the return to experience are calculated for each group. The dependent variable is the log of a person's annual earnings. Our results, shown in table 27, also correct for race/ethnicity, age, marital status, year, and hours worked.[55] We allow returns to experience to vary based on age; we calculate years of experience as (age - years of education - 6).

Our results indicate that returns to experience are highest for workers with relatively little experience; returns fall over time and eventually become negative (but very small) for both technical and nontechnical workers. As we expected, returns are smaller for nontechnical workers than for technical workers.

55. Excluded categories: white (non-Hispanic), aged 18-27, high school degree, unmarried.

Table 27. Regression results—returns to experience—CPS sample, technical and nontechnical workers

| Independent variable | Coefficient | Standard error | Probability coefficient equals zero |
|---|---|---|---|
| | Technical workers | | |
| Hispanic | -0.1127334 | 0.0071386 | 0.000 |
| Black | -0.1275807 | 0.0083208 | 0.000 |
| Other, non-white | -0.030834 | 0.0095239 | 0.001 |
| Some college | 0.1398116 | 0.005513 | 0.000 |
| Associate's degree | 0.1546744 | 0.006503 | 0.000 |
| BA/BS degree | 0.4018448 | 0.0052505 | 0.000 |
| Age 28-37 | 0.2322628 | 0.0162907 | 0.000 |
| Age 38-47 | 0.4324282 | 0.0257181 | 0.000 |
| Age 48 plus | 0.7391129 | 0.0246481 | 0.000 |
| Experience: 18-27 | 0.0518435 | 0.0021153 | 0.000 |
| Experience: 28-37 | 0.0211342 | 0.0010465 | 0.000 |
| Experience: 38-47 | 0.0084725 | 0.0010813 | 0.000 |
| Experience: 48+ | -0.0023662 | 0.000656 | 0.000 |
| Married | 0.1336501 | 0.0044832 | 0.000 |
| Hours last year | 0.0090791 | 0.0002282 | 0.000 |
| Year | 0.0151749 | 0.000564 | 0.000 |
| Constant | -20.93149 | 1.12572 | 0.000 |
| | Nontechnical workers | | |
| Hispanic | -0.148561 | 0.0050128 | 0.000 |
| Black | -0.1348265 | 0.0057635 | 0.000 |
| Other, non-white | -0.1531727 | 0.0083507 | 0.000 |
| Some college | 0.12222533 | 0.0041214 | 0.000 |
| Associate's degree | 0.1502443 | 0.0060809 | 0.000 |
| BA/BS degree | 0.3414214 | 0.0052627 | 0.000 |
| Age 28-37 | 0.3203927 | 0.0144668 | 0.000 |
| Age 38-47 | 0.4787265 | 0.0243926 | 0.000 |
| Age 48 plus | 0.8968141 | 0.0227644 | 0.000 |
| Experience: 18-27 | 0.050392 | 0.0013471 | 0.000 |
| Experience: 28-37 | 0.0126365 | 0.0009435 | 0.000 |
| Experience: 38-47 | 0.0048207 | 0.0010176 | 0.000 |
| Experience: 48+ | -0.0096766 | 0.0006084 | 0.000 |
| Married | 0.1794054 | 0.0037114 | 0.000 |
| Hours last year | 0.0089939 | 0.000197 | 0.000 |
| Year | 0.0110975 | 0.0004952 | 0.000 |
| Constant | -12.97092 | 0.9885299 | 0.000 |

# References


[1] Carol S. Moore, Heidi L. W. Golding, and Henry S. Griffis. *Manpower and Personnel IWAR 2000: Aging the Force,* Jan 2001 (CNA Annotated Briefing D0003079)

[2] Michael L. Hansen, Henry S. Griffis, and Deena Ackerman. *Steady-State Accession Requirements,* Mar 2003 (CNA Research Memorandum D0007675)

[3] Michael L. Hansen and Jennie W. Wenger. *Why Do Pay Elasticity Estimates Differ?* Mar 2002 (CNA Research Memorandum D0005644)

[4] Chief of Naval Operations Executive Board. *End Strength,* Jul 2002 (CNO Executive Board Briefing)

[5] James N. Dertouzos. *Recruiter Incentives and Enlistment Supply,* 1985 (RAND Report R-3065-MIL)

[6] Peggy A. Golfin and Amanda B. N. Kraus, with Lynda G. Houck, David Gregory, and David L. Reese. *Analysis of the Navy's Increased Cap on Accessions of Non-High-School-Diploma Graduates in FY99,* Aug 2001 (CNA Annotated Briefing D0004011)

[7] Donald J. Cymrot. *Rethinking the Recruiting of High School Dropouts: The B-Cell/C-Cell Tradeoff,* Dec 1995 (CNA Annotated Briefing 95-105)

[8] Laura J. Junor and Jessica S. Oi. *A New Approach to Modeling Ship Readiness,* Apr 1996 (CNA Research Memorandum 95-239)

[9] Lung-Fei Lee. "Unionism and Wage Rates." *International Economic Review,* 1978: 415-33

[10] Caroline M. Hoxby. "How Teachers' Unions Affect Productivity." *Quarterly Journal of Economics,* 1996: 61-718

[11] Ann P. Bartel. "Training, Wage Growth, and Job Performance: Evidence From a Company Database." *Journal of Labor Economics* July 1995: 410-425

[12] Michael L. Hansen. *Compensation and Enlisted Manning Shortfalls,* Sep 2000 (CNA Research Memorandum D0001998)

[13] Linda C. Cavalluzzo and Jeremy A. Arkes. *Comparisons of Enlisted and Civilian Pay,* Aug 1998 (CNA Annotated Briefing 98-88)

[14] Matthew S. Goldberg. *A Survey of Enlisted Retention: Models and Findings,* Nov 2001 (CNA Research Memorandum D0004085)

[15] John T. Warner and Matthew S. Goldberg. "The Influence of Non-Pecuniary Factors on Labor Supply: The Case of Navy Enlisted Personnel." *Review of Economics and Statistics,* 66(1), Feb 1984: 26-35

[16] Robert A. Levy, Richard D. Miller, and Pamela S. Brannman. *The DoD Health Care Benefit: How Does it Compare to FEHBP and Other Plans?* May 2000 (CNA Research Memorandum D0001316)

[17] Eric W. Christensen et al. *Life-Cycle Costs of Selected Uniformed Health Professions (Phase I: Cost Model Methodology),* Apr 2003 (CNA Research Memorandum D0006686)

[18] Henry S. Griffis, Heidi L. Golding, and Carol S. Moore. *Costs and Benefits of Aging the Navy's Enlisted Force,* Oct 1997 (CNA Annotated Briefing 97-14)

[19] Office of the Under Secretary of Defense for Personnel and Readiness. *The Report of the Ninth Quadrennial Review of Military Compensation, Volume 1,* Mar 2002

[20] Henry S. Griffis et al. Comparing ROI Across Personnel Programs, Jun 2002 (CNA Annotated Briefing D0006342.A1)

[21] Congressional Budget Office. *What Does the Military "Pay Gap" Mean?* Jun 1999

[22] Gerald E. Cox. *The Time Is Now: Proposals for Two Enlistment Incentive Experiments,* Apr 2003 (CNA Research Memorandum D0007707)

[23] John T. Warner, C. Simon, and D. Payne. *Enlistment Supply in the 1990s: A Study of the Navy College Fund and Other Enlistment Incentive Programs,* Apr 2001 (DMDC Report 2000-015)

[24] Chief of Naval Operations Executive Board. *Investing in People,* Jan 2002 (CNO Executive Board Briefing)

[25] M. Rebecca Kilburn and Jacob A. Klerman. *Enlistment Decisions in the 1990s: Evidence From Individual-Level Data,* 1999 (RAND Report MR-944-OSD/A)

[26] Daniel D. Goldhaber. *An Econometric Analysis of the Enlisted Goaling Model,* Jun 1999 (CNA Research Memorandum 99-20)

# List of tables